APPENDIX A

June 26, 2007

List of Class I Areas in or Impacted by Midwest RPO States

The purpose of this paper is to provide a draft list of Class I areas located within or impacted by a Midwest Regional Planning Organization (MRPO) State. A variety of technical analyses were considered in developing the draft list, including base year (2002) and future year (2018) modeling, back trajectories, and other data analyses. This information shows that every MRPO State impacts multiple Class I areas in the eastern U.S.

Regulatory Requirements

EPA's regional haze rule requires a state to "address regional haze in each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State which may be affected by emissions from within the State." (40 CFR Part 51.308(d)). EPA has interpreted this provision as requiring a table identifying each mandatory Class I Federal area located within the State and each mandatory Class I Federal area located outside the State affected by emissions from within the State (see Draft EPA Checklist for Regional Haze SIPs Submitted Under 40 CFR 51.308 - *7/13/06 Staff Draft*).

Discussion

Technical analyses conducted by the RPOs were consulted to obtain information on areas of influence and culpability for Class I areas in the eastern U.S.[1] A summary of this information is provided below and in Table 1.

For the MRPO analyses, a state was assumed to affect visibility impairment in a Class I area if it contributes 2% (or more) to total light extinction. This criterion was selected based on a review of the back trajectory and modeling results which showed that states contributing 2% (or more) make-up about 90-95% of total light extinction, whereas states contributing 5% (or more) make-up only about 75-80% of total light extinction. For the other RPO analyses, deference was given to the criteria established by each group to identify contributing states.

(1) MRPO Back Trajectory Analyses

An initial trajectory analysis was conducted using data for 1997-2001 (all sampling days), a start height of 200 m, and a 72-hour (3-day) trajectory period (Cite: "Quantifying Transboundary Transport of PM2.5: A GIS Analysis," May 2003, LADCO). By combining trajectory frequencies with concentration information, the average contribution to $PM_{2.5}$ mass and individual $PM_{2.5}$ species was estimated (which, in turn, was used to estimate the average contribution to light extinction). The results for 17 Class I areas in eastern U.S. were examined to identify those Class I areas where an MRPO state had at least a 2% contribution to total light extinction (based on all days).

A second trajectory analysis was conducted using data for 2000-2003 (20% highest and lowest days), a start height of 200m, and a 120-hour (5-day) trajectory period (Cite: "Sensitivity

[1] Back trajectories and modeling conducted by the WRAP indicate that the Midwest RPO States are not important contributors to visibility impairment due to sulfates and nitrates in western Class I areas (Cite: "Attribution of Haze Phase I Report, Geographic Attribution for the Implementation of the Regional Haze Rule," March 14, 2005). The analyses show only five groups of western Class I areas with at least 5% contribution from states outside the WRAP. The outside-WRAP contribution is generally small (on the order of 0-15%), and is likely due mostly to nearby CENRAP states.

Analysis of Various Trajectory Parameters," June 2005, LADCO). Back trajectory plots were prepared for each of the four northern Class I areas in Michigan and Minnesota for the high extinction days (see Figure 1 – note: areas in orange are mostly likely upwind and the areas in green are least likely upwind on poor visibility days). Although somewhat qualitative, these results provide additional information in identifying states impacting the northern Class I areas.

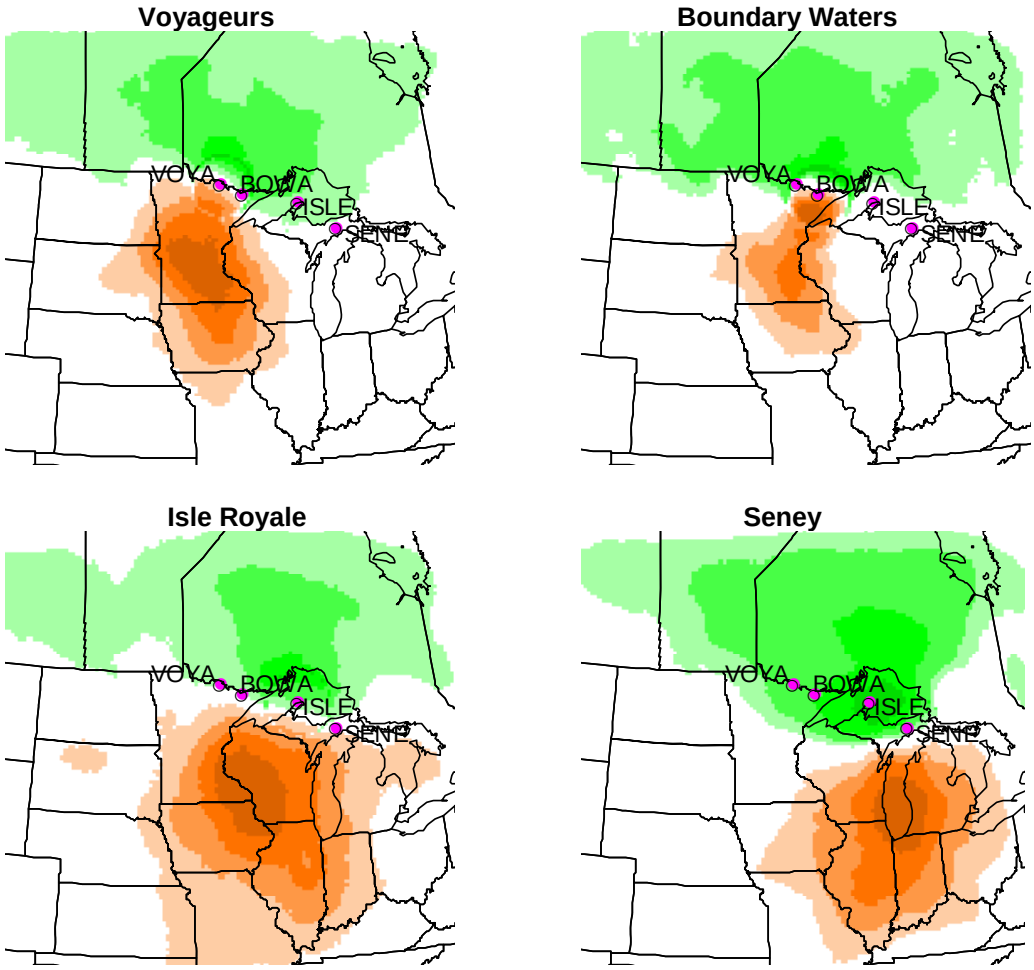

Figure 1. Contoured trajectory plots for poor visibility days for Class I areas in northern Minnesota and Michigan

(2) MRPO PSAT Modeling

A photochemical grid model (CAMx) was applied to provide source contribution information for 2018 conditions. Specifically, the model estimated the impact of 18 geographic source regions and 6 source sectors (EGU point, non-EGU point, on-road, off-road, area, and ammonia sources) at Class I areas in the eastern U.S. Example results for four Class I areas (Seney, Mammoth Cave, Mingo, and Shenandoah) are presented in Figure 2. The results for 13 Class I areas in eastern U.S. were examined to identify those Class I areas where an MRPO state had at least a 2% contribution to total light extinction.

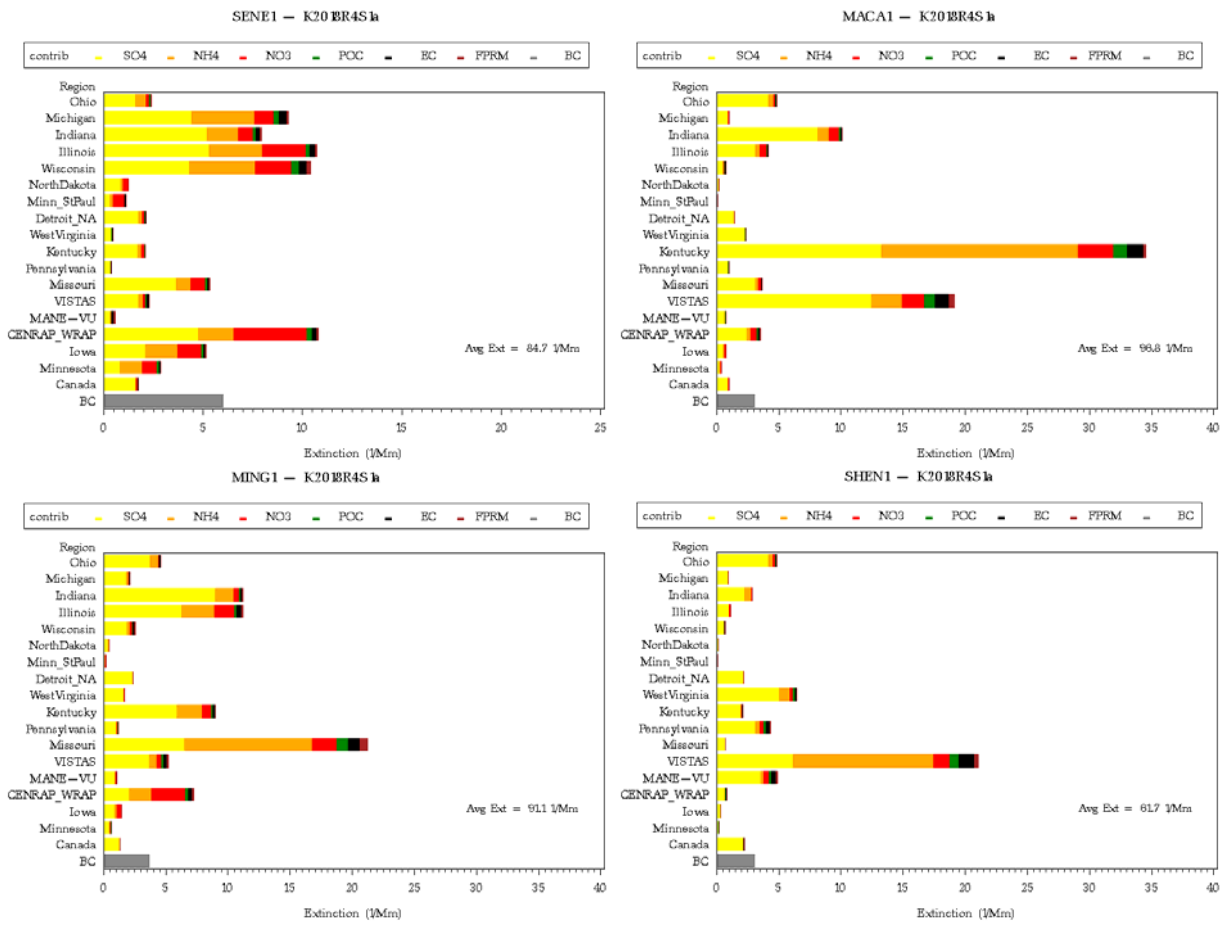

Figure 2. Source region contributions to light extinction based on MRPO PSAT modeling for select Class I areas: Seney, Mammoth Cave, Mingo, and Shenandoah

(3) MANE-VU Contribution Assessment

A weight-of-evidence report was prepared by NESCAUM (on behalf of MANE-VU) to understand the causes of sulfate-driven visibility impairment at Class I areas in the northeastern and mid-Atlantic portions of the U.S. (cite: "Contributions to Regional Haze in the Northeast and Mid-Atlantic United States," August 2006). The report provides information on the relative contribution of various emissions sources and geographic source regions. The analytical and assessment tools considered include Eulerian and Lagangian air quality models, and data analysis techniques, such as source apportionment analyses, back trajectories, and examination of emissions and monitoring data. Sulfate impacts were quantified using five analytical techniques based on 2002 conditions: REMSAD, Q/d, CALPUFF (w/ NWS data), CALPUFF (w/ MM5 data), and percent time upwind (based on trajectory analyses). Figure 3 summarizes the five sets of results for three MANE-VU Class I areas. Although no specific criteria were identified in the report to determine a significant contribution, the States of Vermont, New Hampshire, Maine, and New Jersey assumed a 2% sulfate impact in recent letters to other states inviting them to consult on reasonable progress goals. The MRPO States identified as contributing to a MANE-VU Class I area were Illinois, Indiana, Michigan, and Ohio

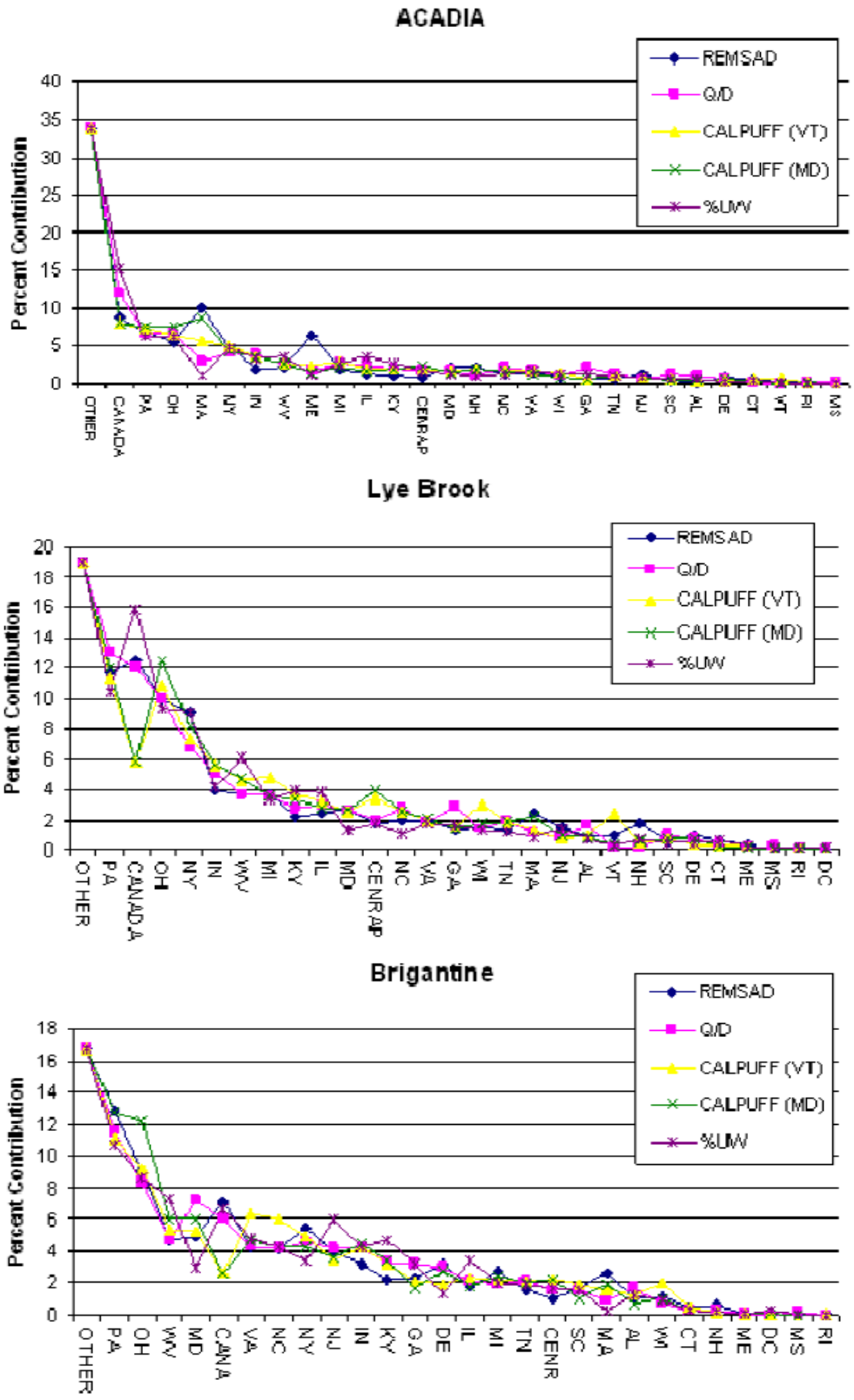

Figure 3. Percent contribution results using different techniques for ranking state contributions to sulfate levels at MANE-VU Class areas (cite: "Contributions to Regional Haze in the Northeastern and Mid-Atlantic Portions of the U.S.," August 2006)

(4) Missouri-Arkansas Contribution Assessment

The draft Consultation Plan for the two Missouri and two Arkansas Class I areas provides information on source regions affecting these Class I areas (i.e., areas of influence) using a variety of data and analyses. (cite: "Central Class I Areas Consultation Plan," States of Missouri and Arkansas, February 2007) A decision on whether a given state is a contributor to visibility impairment in these Class I areas was based on the combined results of three approaches: areas of influence (see Figure 4), PSAT modeling (based on 2018 conditions), and monitoring data analyses (PMF and back trajectories). According to the draft plan, if a state was a major contributor for at least two of the three approaches (for either sulfate or nitrate), then it was determined to be a significant contributor. The MRPO States identified as contributing to a central CENRAP Class I area were Illinois, Indiana, and Ohio.

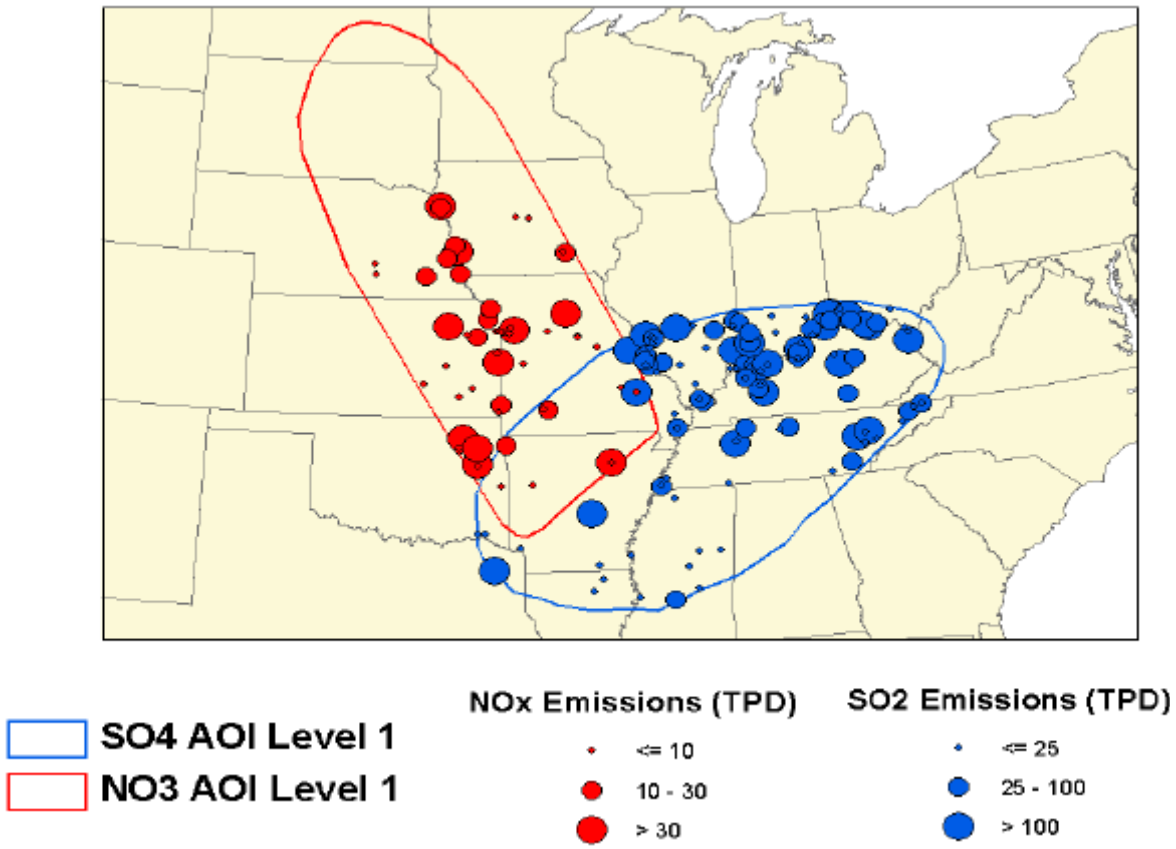

Figure 4. Areas of Influence for Central CENRAP Class I Areas (cite: "Central Class I Areas Consultation Plan," States of Missouri and Arkansas, February 2007)

(5) VISTAS Area of Influence Analysis

Areas of influence (AOI) were identified for Class I areas in the southeastern U.S. using residence time plots based on wind trajectory direction and frequency, and weighted by visibility impact (light extinction by ammonium sulfate, ammonium nitrate, or elemental carbon). (Cite: "VISTAS Areas of Influence Analysis," Draft, February 28, 2007). These extinction-weighted residence time analyses were overlaid on gridded emissions (for both 2002 and 2018) to define emission sources in the areas of greatest influence for each Class I area. Figure 5 shows the plots for two VISTAS Class I areas. AOIs were defined on the basis of residence times greater than 10%. The MRPO States identified as contributing to a VISTAS Class I area were Illinois, Indiana, and Ohio.

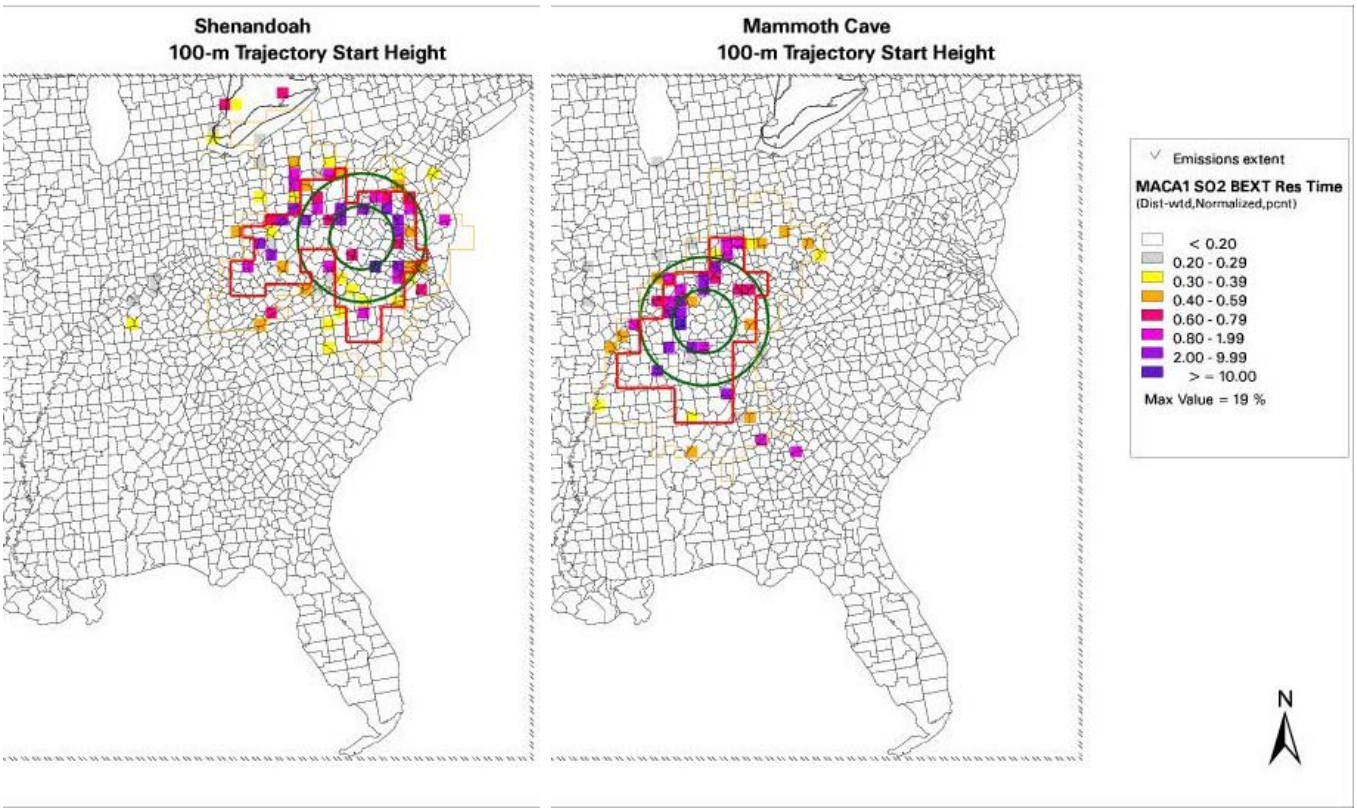

Figure 5. Areas of Influence for Shenandoah (left) and Mammoth Cave (right) for 2018 conditions (cite: "VISTAS Area of Influence Analyses" PowerPoint presentation, November 28, 2006)

Note: green circles indicate 100- and 200-km radii from Class I area, red line perimeter indicate AOI with residence time ≥ 10%, and orange line perimeter indicate AOI with residence time ≥ 5%

Table 1. Draft List of Class I Areas Impacted by MRPO States - References

AREA NAME	IL	IN	MI	OH	WI
81.401 Alabama.					
Sipsey Wilderness Area	(1)	(1)			
81.404 Arkansas.					
Caney Creek Wilderness Area	(2), (4)	(2), (4)		(2), (4)	
Upper Buffalo Wilderness Area	(1),(2),(4),(5)	(2), (4)		(2), (4)	(2)
81.408 Georgia.					
Cohotta Wilderness Area					
Okefenokee Wilderness Area					
Wolf Island Wilderness Area					
81.411 Kentucky.					
Mammoth Cave NP	(1), (2), (5)	(1), (2), (5)	(1), (2)	(1), (2), (5)	
81.412 Louisiana.					
Breton Wilderness Area					
81.413 Maine.					
Acadia National Park	(3)	(3)	(3)	(3)	
Moosehorn Wilderness Area.	(3)	(3)	(3)	(3)	
81.414 Michigan.					
Isle Royale NP.	(1), (2)	(1), (2)	(1), (2)		(1), (2)
Seney Wilderness Area	(1), (2)	(1), (2)	(1), (2)	(1), (2)	(1), (2)
81.415 Minnesota.					
Boundary Waters Canoe Area Wilderness	(2)	(2)	(2)		(1), (2)
Voyageurs NP	(2)	(2)			(1), (2)
81.416 Missouri.					
Hercules-Glades Wilderness Area	(2), (4), (5)	(2), (4), (5)		(2), (4)	(2)
Mingo Wilderness Area	(2), (4), (5)	(2), (4), (5)	(2)	(2), (4)	(2)
81.419 New Hampshire.					
Great Gulf Wilderness Area	(3)	(3)	(3)	(1), (3)	
Pres. Range-Dry River Wilderness Area.					
81.42 New Jersey.					
Brigantine Wilderness Area	(3)	(3)	(1), (3)	(1), (3)	

81.422 North Carolina.					
Great Smoky Mountains NP{1}	(1)	(1)		(1)	
Joyce Kilmer-Slickrock Wilderness Area{2}					
Linville Gorge Wilderness Area.					
Shining Rock Wilderness Area.					
Swanquarter Wilderness Area					
81.426 South Carolina.					
Cape Romain Wilderness					
81.428 Tennessee.					
Great Smoky Mountains NP{1}.	(1)	(1)		(1)	
Joyce Kilmer-Slickrock Wilderness{2}					
81.431 Vermont.					
Lye Brook Wilderness	(2), (3)	(2), (3)	(2), (3)	(1), (2), (3)	
81.433 Virginia.					
James River Face Wilderness.	(2)	(2)	(2)	(2), (5)	
Shenandoah NP	(2), (3)	(1), (2), (3)	(2), (3)	(1),(2),(3),(5)	
81.435 West Virginia.					
Dolly Sods/Otter Creek Wilderness.	(2), (3)	(1), (2), (3)	(1), (2), (3)	(1),(2),(3),(5)	

Key
(1) MRPO Back Trajectory Analyses
(2) MRPO PSAT Modeling
(3) MANE-VU Contribution Assessment
(4) Missouri-Arkansas Contribution Assessment
(5) VISTAS Areas of Influence

APPENDIX B

APPENDIX C

March 9, 2001

Midwest Regional Planning Organization

PRINCIPLES FOR REGIONAL PLANNING

The purpose of this paper is to outline the Midwest Regional Planning Organization's principles for regional planning to address regional haze.

Background

In 1999, the United States Environmental Protection Agency (USEPA) promulgated regional haze regulations that, among other things, require all states to develop regional haze rules to establish goals and emission reduction strategies for improving visibility due to regional haze in the 156 national park and wilderness areas throughout the United States designated as mandatory Federal Class I areas. USEPA's regional haze regulations allow for, and encourage through deferment of deadlines, a coordinated approach to addressing regional haze issues. As part of the implementation of the regional haze regulations, USEPA has provided grant funds for five regional planning organizations (RPOs) to facilitate their efforts to assess visibility impairment in the region. Ohio has been included for this purpose with the States of Illinois, Indiana, Michigan, and Wisconsin in the Midwest RPO.

Purpose

The Midwest RPO is a non-regulatory entity whose purpose is to provide technical assessments for and assistance to its members on problems of air quality, and provide a forum for its members to discuss air quality issues. In particular, the Midwest RPO shall assess visibility impairment due to regional haze in the mandatory Federal Class I areas located inside the borders of the States of Illinois, Indiana, Michigan, Ohio, and Wisconsin, and the impact of emissions from the five states (including tribal lands in the five states) on visibility impairment due to regional haze in the mandatory Federal Class I areas located outside the borders of the five states.

Roles and Responsibilities

The regional planning process will include states, tribes, Federal Land Managers and other Federal agencies, such as USEPA, and other interested stakeholders, including citizen groups and industry.

The states have the primary regulatory responsibility and authority under the regional haze regulations. Specifically, pursuant to 40 CFR Part 51, Subpart P, section 51.300, states are required to ...develop programs to assure reasonable progress toward meeting the national goal of preventing any future, and remedying any existing, impairment of visibility in mandatory Class I Federal areas which impairment results

from manmade air pollution... . As noted in the preamble to the regional haze regulations, states are required to ...develop SIP revisions to address regional haze, to update the SIP every 10 years, and to continue to evaluate progress toward the national visibility goal. To facilitate the interaction of the states in meeting their regulatory obligations, the five states entered into a Memorandum of Agreement on October 26, 2000 (Memorandum of Agreement for the Midwest Regional Planning Organization to Address Regional Haze).

In the preamble to the regional haze regulations, USEPA noted that tribal participation can help provide emissions inventory information to better understand the importance of sources in Indian country to regional visibility impairment, and provide a forum for tribal participants to alert RPO s to air quality concerns in Indian country. At this time, tribes in the Midwest RPO states have no regulatory responsibility under the regional haze regulations. Nevertheless, tribes shall retain a special consultation role in the regional planning process, and shall participate at the Midwest RPO policy, planning, and technical levels.

The Federal Government, including Federal Land Managers (FLMs) and USEPA, should be involved in the regional planning process. As custodians of the national parks and wilderness areas and as a source of air pollution (e.g., prescribed burns) in and around national parks and wilderness areas, the FLMs need to participate in the regional planning process. Furthermore, the regional haze regulations require states to consult with FLMs before adopting and submitting their regional haze SIPs. Thus, FLMs and USEPA will have a special consultation role in the regional planning process and shall participate at the Midwest RPO policy, planning, and technical levels.

The Midwest RPO will attempt to operate on a consensus approach on technical and policy matters. While the states have the primary regulatory responsibility and authority, tribes (and appropriate Federal agencies) will be involved in the decision-making process.

Stakeholders should be involved in both an advisory role and on technical workgroups. All workgroup members (i.e., states, tribes, USEPA, FLMs., and stakeholders) must be active and constructive participants, and agree to share technical information. Casual observers are discouraged from joining the technical workgroups.

Also, the Midwest RPO recognizes the need for interregional coordination on a wide range of regional haze and visibility issues. To that end, the Midwest RPO will work cooperatively with other RPOs on administrative and technical issues.

Organizational Structure
The Midwest RPO will be organized as follows (see attached figure):

Policy Steering Committee - The Policy Steering Committee will consist of the Environmental Directors of the member states of the Midwest RPO, tribal representatives, Federal Land Managers, and the Regional Administrator of USEPA, Region 5 (or his designee). The Policy Steering Committee shall provide the overall policy direction for the regional planning effort, and shall serve as the forum for the resolution of disputes. The Policy Steering Committee will meet as appropriate to oversee the progress of the effort.

Technical Steering Committee - The Technical Steering Committee will consist of the Directors of the Air Quality offices of the member states of the Midwest RPO, tribal representatives, Federal Land Managers, and the Director of the Air and Radiation Division of USEPA, Region 5. The Technical Steering Committee shall be responsible for the management of the regional planning effort, and shall meet as necessary to carry out these duties.

Project Team - Personnel designated by the Directors of the Air Quality offices of the member states of the Midwest RPO and by the tribal representatives shall organize a Project Team to carry out the directions of the Technical Steering Committee and to guide the development of the regional planning effort. In addition, the USEPA, U.S. National Park Service, U.S. Forest Service, and U.S. Fish and Wildlife Service shall designate representatives to participate on the Project Team. The states and tribes will make every reasonable effort to ensure that the designated representatives receive support for full participation in the regional planning process. The Project Team shall prepare a long-range strategy of the regional planning process, as well as detailed annual work plans. The Project Team will meet on a regular basis and may form appropriate technical workgroups as necessary to address specific concerns (e.g., monitoring, emissions, data analysis, modeling, and public outreach).

LADCO - Subject to the availability of funding, the professional staff of LADCO shall be available to work on the regional planning effort. LADCO staff shall support the activities of the Policy Steering Committee, Technical Steering Committee, and the Project Team.

Advisory Committee - The Advisory Committee will consist of representatives from citizen groups, industry, academia, and local government located within the five states. These representatives are expected to provide a range of perspectives which need to heard from in the regional planning process. Each state will designate at least four representatives to serve on the Advisory Committee. The Advisory Committee will meet on a regular basis.

Travel Policy

To promote the participation of states and tribes in the regional planning process, grant funds can be used to pay for travel for state and tribal representatives to attend Midwest RPO and national RPO meetings. Reimbursable expenses include costs for transportation, lodging, and meals. (Note, it may be necessary to limit the number of representatives from each state or tribe receiving reimbursement for a given meeting.)

Scope of Work

The regional planning process is expected to consist of three phases:

Phase I: ***Organization and Coordination Phase***

This phase will take place during the first two years. The objective of this phase is to develop a framework for regional planning.

Phase II: ***Technical Assessment Phase***

This phase is expected to take place over the first five years or so. Additional details will be provided in the work plans provided with each year s grant application. The objectives of this phase include: (1) understanding current pollution levels; (2) identifying the principal contributing sources; (3) determining which states or areas contribute to another state s problem, and (4) estimating the impact of future strategies on air quality, costs, and other factors.

Phase III: ***Strategy Development, Adoption, and Implementation***

This phase will take place after the technical assessment phase is completed and will be addressed in a future work plan. The objectives of this phase include: (1) reaching consensus about the regional strategies needed to make reasonable progress toward the national visibility goal in Class I areas, and (2) adopting and implementing SIPs which reflect the regional strategy.

Midwest Regional Planning Organization

ORGANIZATIONAL STRUCTURE

APPENDIX D

Description of Isle Royale National Park and Seney Wilderness Area

Isle Royale National Park

A description of the Isle Royale IMPROVE site is given in the table below. The monitor for Isle Royale is located off-site of the island on the Keweenaw Peninsula. The monitoring site was formerly located on the island itself, however, due to accessibility problems during the winter, the monitoring site was moved to the main land.

Information from VIEWS website

SiteCode:	**ISLE1**
SiteName:	**Isle Royale NP**
State:	**MI**
StateFIPS:	**26**
CountyFIPS:	**083**
Latitude:	**47.4596**
Longitude:	**-88.1491**
ElevationMSL:	**182**
StartDate:	**11/16/1999**
EPARegion:	**5**
ImproveRegionID:	**3**
AQCRID:	**0**
CMSAID:	**0**
AirBasinID:	**0**
UrbanAreaID:	**0**
AgencyID:	**1648**
LocDesc:	**Near the boat ramp on point opposite town of Eagle Harbor**
ProgramCode:	**IMPROVE**
NativeSiteCode:	**ISLE1**
Sponsor:	**NPS**

Seney Wilderness Area

A description of the Seney IMPROVE site is given in the table below. The monitor for Seney is located on-site of the Seney Wilderness area.

Information from VIEWS website

SiteCode:	**SENE1**
SiteName:	**Seney**
State:	**MI**
StateFIPS:	**26**
CountyFIPS:	**153**
Latitude:	**46.2889**
Longitude:	**-85.9503**
ElevationMSL:	**214.5**
StartDate:	**11/16/1999**
EPARegion:	**5**
ImproveRegionID:	**3**
AQCRID:	**0**
CMSAID:	**0**
AirBasinID:	**0**
UrbanAreaID:	**0**
AgencyID:	**1646**
LocDesc:	**Near Refuge Headquarters**
ProgramCode:	**IMPROVE**
NativeSiteCode:	**SENE1**
Sponsor:	**FWS**

APPENDIX E

Regional Haze in the Upper Midwest:

Summary of Technical Information

Isle Royale National Park

December 20, 2006

Scope of Document

This document provides a summary of available technical information about regional haze and visibility impairment in the four northern class I areas: Boundary Waters Canoe Area Wilderness, Voyageurs National Park, Isle Royale National Park, and Seney Wilderness Area. This information includes a conceptual model of haze, the technical basis for visibility analysis, and the effectiveness of control measures in improving visibility. The document represents the technical information agreed to by the responsible states and satisfies, in part, the consultation requirements of the Regional Haze Rule.

This document does not address policy issues and strategies necessary to deal with regional haze. States can use this technical information to highlight the relevant issues for their state policymakers. For policy issues or decisions that require agreement between the northern class I area states, a separate policy document will be developed. This other document will address the development of the reasonable progress goal, each state's share of emission reductions, and coordinated emission control strategies. These decisions will be based on, but be separate from, the technical information.

Executive Summary

The States of Michigan and Minnesota, along with representatives of other states, tribal governments, and federal agencies[1], are working to address visibility impairment due to regional haze in four northern class I areas: Boundary Waters Canoe Area Wilderness, Voyageurs National Park, Isle Royale National Park, and Seney Wilderness Area. Pursuant to the Clean Air Act, states are required to make reasonable progress toward meeting a national goal of natural conditions (i.e., visibility levels in the absence of manmade air pollution).

Class I areas in Michigan and Minnesota[2]

Based on a review of technical information, several key findings should be noted:

- The chemical species which affect visibility impairment include ammonium sulfate and, to a lesser degree, ammonium nitrate and organic carbon.

- The pollutants and source sectors which contribute the most to visibility impairment include SO2 emissions from electrical generating units (EGUs), which lead to sulfate formation, and NOx emissions from a variety of source types (e.g., motor vehicles), which lead to nitrate formation. Ammonia emissions from livestock waste and fertilizer applications are also important, especially for nitrate formation. (Organic carbon concentrations are thought to be mostly secondary organic aerosols of biogenic origin and, on an occasional episodic basis, from fire activity.)

- The source regions which contribute the most to visibility impairment are the States of Michigan, Minnesota, and Wisconsin. Other nearby states, including North Dakota, Iowa, and Illinois, also contribute to visibility impairment.

- Current (baseline) visibility levels are well above natural conditions (see, for example, picture below for Boundary Waters Canoe Area).

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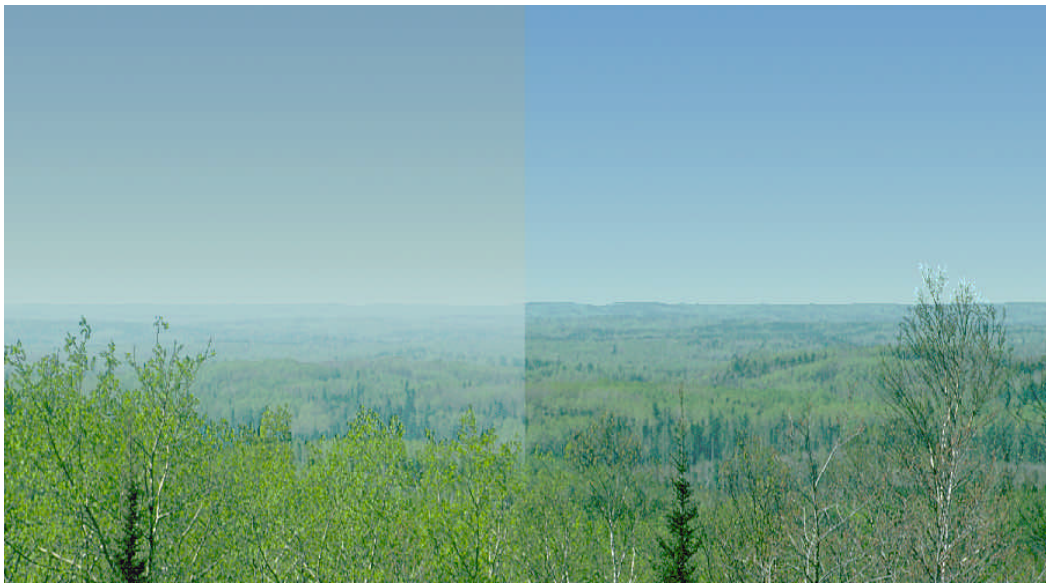
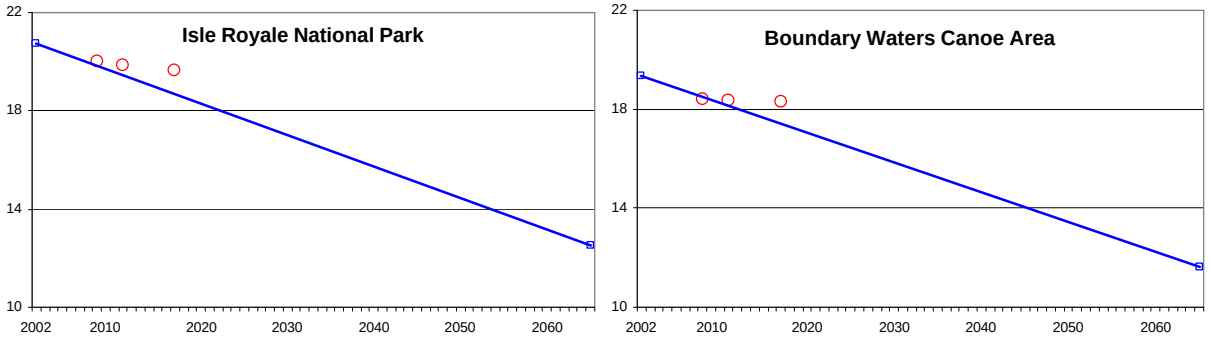
[1] Representatives from the following entities are participating in the northern states class I area consultation process: States of Minnesota, Michigan, Wisconsin, North Dakota, Iowa, Missouri, Illinois, and Indiana; Ontario Ministry of Environment; Mille Lacs, Fond du Lac, Grand Portage, and Leech Lake Tribes; and U.S. Forest Service, U.S. National Park Service, and U.S. EPA.

[2] Visibility is not an air quality related value in Rainbow Lake, so visibility impairment due to regional haze is not a concern in this Class I area.



Boundary Waters Canoe Area – current visibility conditions on 20% worst days are represented on the left hand side and the natural conditions goal are represented on the right hand side

- Projected near-term visibility conditions based on existing ("on the books") controls are above the uniform rate of progress line (see figure below). The regional haze rule calls for class I areas to meet natural visibility conditions by the year 2064, with an initial implementation period extending to the year 2018. Consequently, additional candidate control measures for improving visibility levels need to be considered (e.g., SO2 emission reductions from EGUs). To determine whether these measures provide for reasonable progress, an assessment of four factors (i.e., costs of compliance, time necessary for compliance, energy and non-air quality environmental impacts, and remaining useful life) is being conducted.



Projected future year visibility levels (represented by the "red circles") in Isle Royale National Park (left) and Boundary Waters Canoe Area (right) based on existing controls

- The same particles (sulfates, nitrates, organic carbon, smoke, and soil dust) which affect visibility, are linked to serious health effects (e.g., National Ambient Air Quality Standards for $PM_{2.5}$) and environmental effects (e.g., ecosystem damage). Thus, actions to reduce levels of visibility-impairing pollutants will benefit public health and reduce certain adverse effects to the environment.

Table of Contents

Section 1
Regulatory Requirements

Section 169A of the Clean Air Act sets as a national goal "the prevention of any future and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which implementation results from manmade air pollution."

Section 169A requires states to "make reasonable progress toward meeting the national goal." In determining reasonable progress, states shall consider:

- costs of compliance
- time necessary for compliance
- energy and non-air quality environmental impacts of compliance
- remaining useful life of any existing source subject to such requirements

On July 1, 1999, EPA adopted a regional haze rule to implement the provisions of section 169A by establishing a program to address regional haze visibility impairment. Pursuant to the regional haze rule, the determination of reasonable progress shall also consider:

- uniform rate of visibility improvement (needed to attain natural visibility conditions by 2064) – i.e., "the line" (see, for example, Figure 5)

EPA's regional haze rule requires states to set reasonable progress goals for each class I area which provide for an improvement in visibility for the most impaired days (i.e., 20% worst visibility days) and ensure no degradation in visibility for the least impaired days (i.e., 20% best visibility days).

The regional haze rule also requires states to develop a long-term strategy for regional haze which covers an initial implementation period extending to the year 2018, with a reassessment and revision of the strategy every 10 years.

Section 2
Technical Information

1. Conceptual model of haze

   a. What are the chemical constituents that cause visibility impairment in the northern class I areas?

   The most important chemical species are ammonium sulfate, ammonium nitrate, and organic carbon. The contribution of these species on the 20% best and 20% worst visibility days (based on 2000 – 2004 data) is provided in Figure 1. For the 20% worst visibility days, the contributions are: sulfate = 35-55%, nitrate = 25-30%, and organic carbon = 12-22%. It should also be noted that sulfate and nitrate contribute more to light extinction than to $PM_{2.5}$ mass because of their hygroscopic properties.

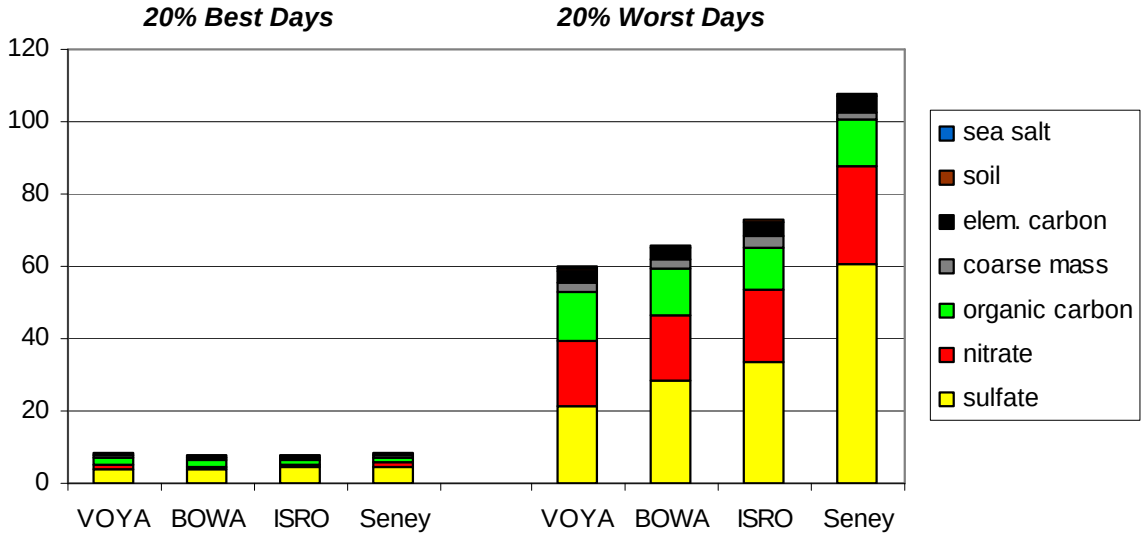


Figure 1. Chemical composition of light extinction for 20% best visibility days (left) and 20% worst visibility days (right) in terms percentages

   b. Which geographic areas and sources contribute to regional haze in the northern class I areas?

   Air quality data analyses and dispersion modeling were conducted to provide information on source region and source sector contributions to regional haze in the northern class I areas (see Appendix: Contribution Assessment for Northern Class I Areas). Based on this information, the most important contributing states are Michigan, Minnesota, and Wisconsin, as well as North Dakota, Iowa, and Illinois. For example, Figure 2 presents the results of composite back trajectories for light extinction on the 20% worst visibility days. The orange areas are where the air is most likely to come from on poor air quality days, and the green areas are where the air is least likely to come from on poor air quality days. As can be seen, bad air days are generally associated with transport from regions located to the south of these class I areas.

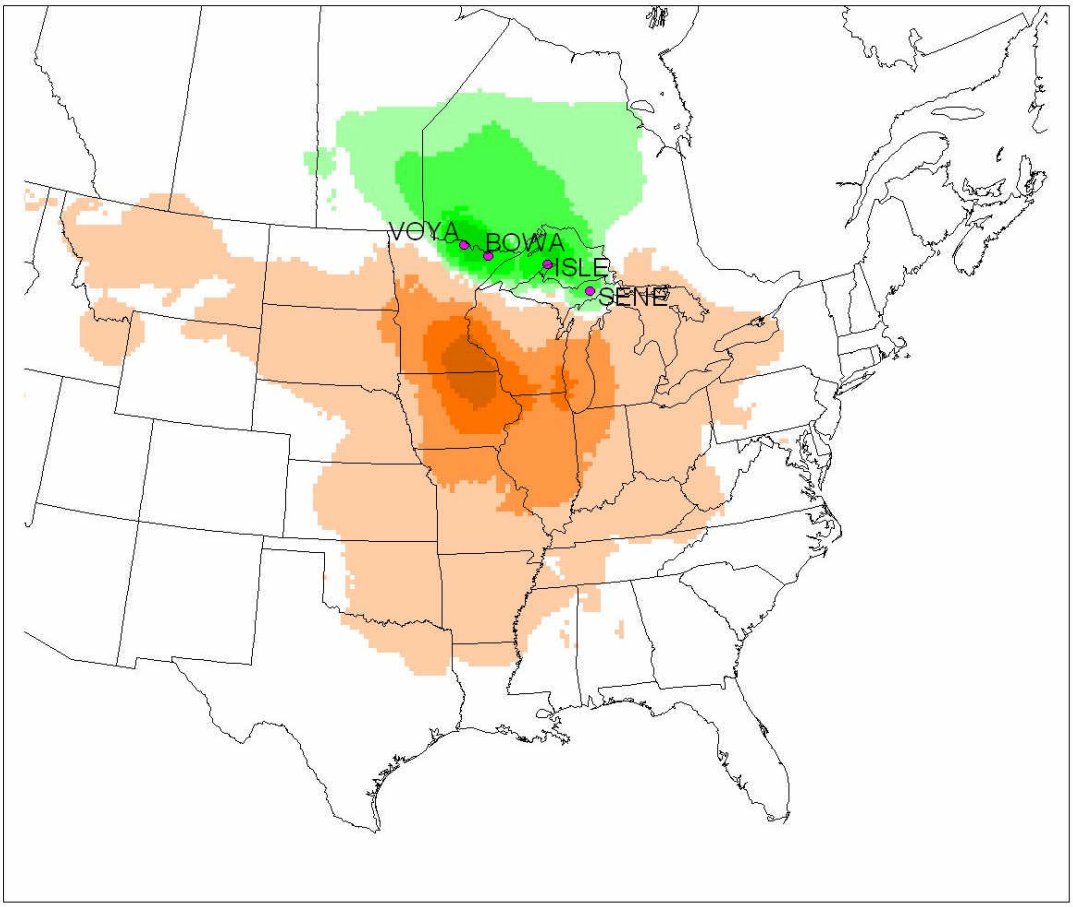


Figure 2. Composite back trajectories for light extinction

The most important contributing pollutants and source sectors are SO2 emissions from electrical generating units (EGUs), which lead to sulfate formation, and NOx emissions from a variety of source types (e.g., motor vehicles), which lead to nitrate formation. Ammonia emissions from livestock waste and fertilizer applications are also important, especially for nitrate formation. (As discussed below, organic carbon concentrations are thought to be mostly secondary organic aerosols of biogenic origin.)

c. What are the meteorological conditions that are associated with good visibility and poor visibility in the northern class I areas? Is there a seasonal effect to visibility impairment in those areas?

As noted above, bad air days are generally associated with southerly transport (see Figure 2). Examination of the 20% worst visibility days for the northern class I areas shows that these days occur throughout the year, suggesting a range of other meteorological parameters (see, for example, Boundary Waters data in Figure 3). This figure, as well as Figure 4 (which presents the monthly average light extinction values based on all sampling days), also show that sulfate and organic carbon concentrations are higher in the summer, and nitrate concentrations are higher in the winter, suggesting the importance of different sources and meteorological conditions at different times of the year.

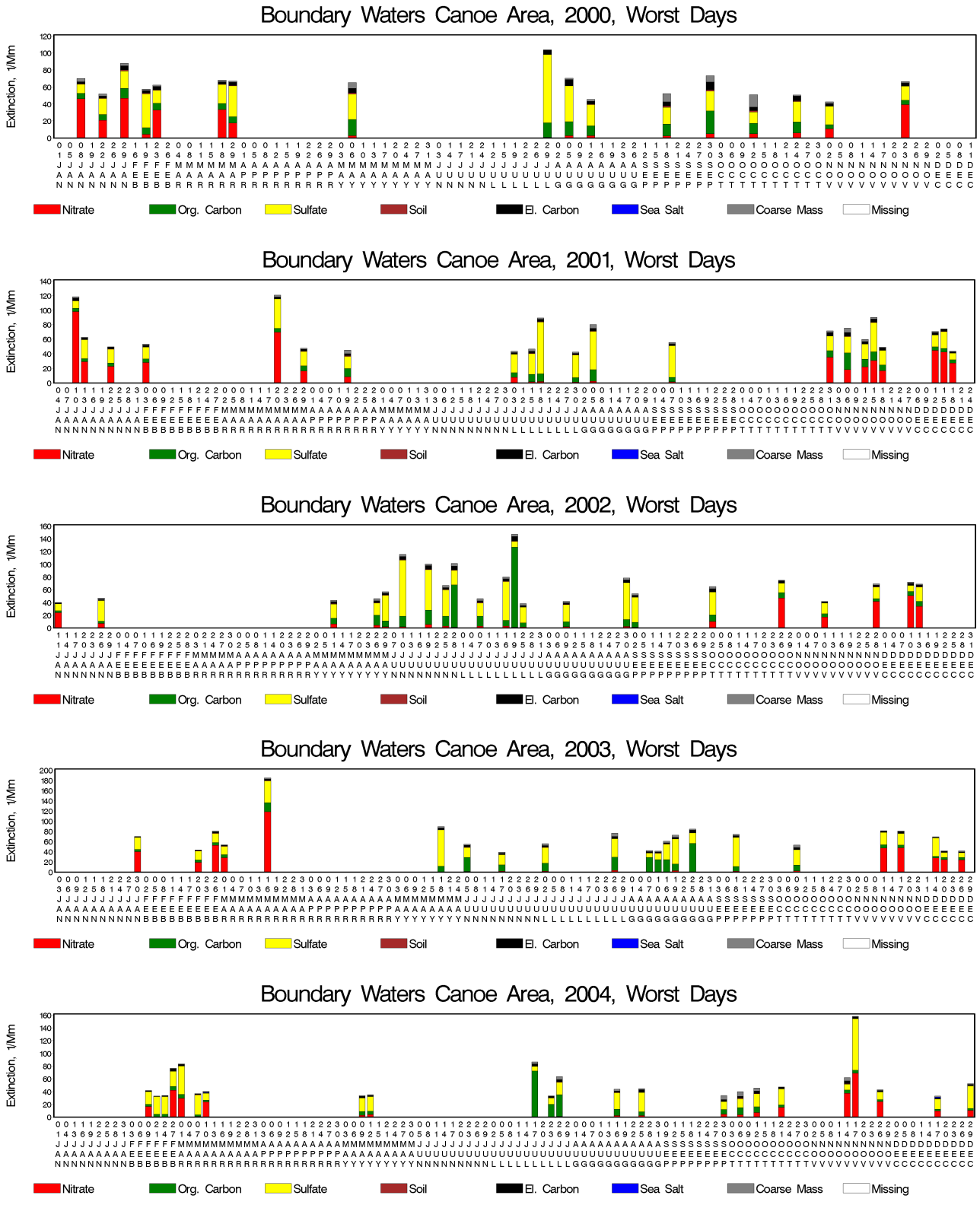


Figure 3. Daily light extinction values for 20% worst days at Boundary Waters (2000 – 2004)

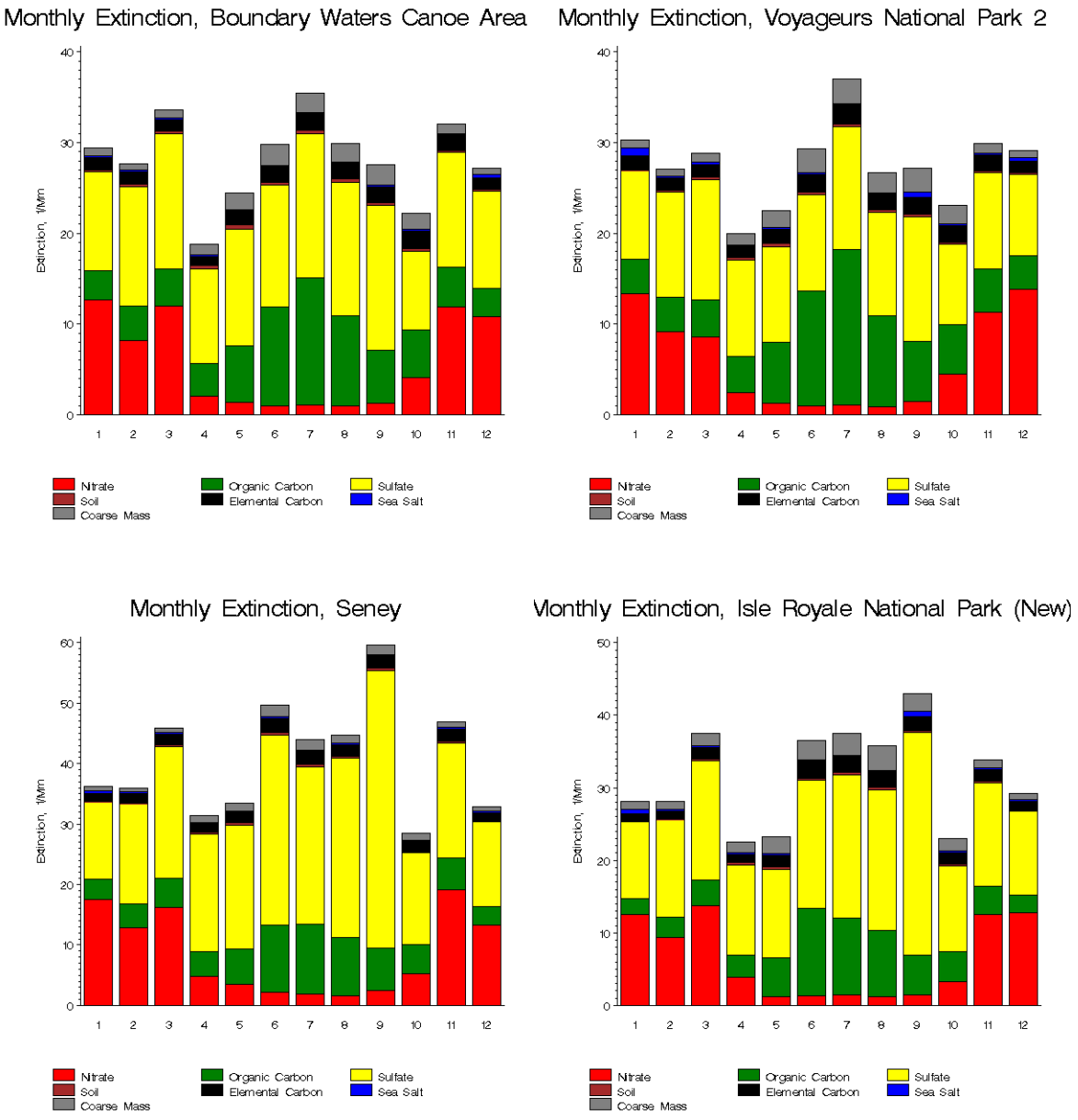


Figure 4. Monthly average light extinction values for northern class I areas

2. Technical basis for visibility-related analyses

a. What are the present visibility conditions and how were the values calculated? How were the 20% worst and 20% best days determined?

Initially, the baseline (2000 – 2004) visibility conditions values were derived using the average for the 20% worst and 20% best days for each year, as reported on the VIEWS website: http://vista.cira.colostate.edu/views/Web/IMPROVE/SummaryData.aspx . These values were calculated using the original IMPROVE equation. This equation was revised by the IMPROVE Steering Committee in 2005, and the new IMPROVE equation was used to calculate updated baseline values. The updated values are reported on the VIEWS website.[3]

A summary of the initial and updated baseline values are presented in Table 1. The updated baseline values (based on the new IMPROVE equation) reflect the most current, complete understanding of visibility impairing effects and, as such, will be used for state implementation plan (SIP) planning purposes.

b. What are natural conditions and how were the values calculated?

Initially, the values for the natural conditions goal for each class I area were taken directly from "Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Program", EPA-454/B-03-005, September 2003. These values were calculated using the original IMPROVE equation. This equation was revised by the IMPROVE Steering Committee in 2005, and the new IMPROVE equation was used to calculate updated natural conditions values. The updated values are reported on the VIEWS website.

A summary of the initial and updated natural conditions values are presented in Table 1. The updated natural conditions values (based on the new IMPROVE equation) will be used for SIP purposes. As noted previously, the states must establish goals that provide for reasonable progress towards achieving national conditions (i.e., an improvement in visibility for the 20% worst days, and no degradation in visibility for the 20% best days).

[3] Due to sampler problems, the 2002-2004 data for Boundary Waters were invalid for certain chemical species. (Note, sulfate and nitrate data at Boundary Waters were valid.) A "substituted" data set was developed by using values from Voyageurs for the invalid species.

Table 1. Summary of Visibility Metrics (deciviews) for Northern Class I Areas

	20% Worst Days					Baseline	Natural	20% Best Days					Baseline
	2000	2001	2002	2003	2004	(Average)	Conditions	2000	2001	2002	2003	2004	(Average)
Old IMPROVE Equation (Cite: VIEWS, November 2005)													
Voyageurs	18.50	18.00	19.00	19.20	17.60	18.46	11.09	6.30	6.20	6.70	7.00	5.40	6.32
BWCA	19.85	19.99	19.68	19.73	17.65	19.38	11.21	5.90	6.52	6.93	6.67	5.61	6.33
Isle Royale	20.00	22.00	20.80	19.50	19.10	20.28	11.22	5.70	6.40	6.40	6.30	5.30	6.02
Seney	22.60	24.90	24.00	23.80	22.60	23.58	11.37	5.80	6.10	7.30	7.50	5.80	6.50
New IMPROVE Equation (Cite: VIEWS, March 2006)													
Voyageurs	19.05	18.57	20.14	20.15	18.40	19.26	12.20	7.01	7.12	7.53	7.68	6.37	7.14
BWCA	19.93	20.04	20.11	20.07	17.79	19.59	11.60	6.00	6.92	7.00	6.45	5.77	6.43
Isle Royale	20.14	22.50	21.51	19.93	19.59	20.73	12.50	6.49	7.16	7.07	6.99	6.12	6.77
Seney	23.01	25.58	24.59	24.48	23.15	24.16	12.80	6.50	6.78	7.82	8.01	6.58	7.14
	URP		**2018 Goal**										
Old IMPROVE Equation													
Voyageurs	0.119		16.56										
BWCA	0.132		17.27										
Isle Royale	0.146		17.94										
Seney	0.197		20.43										
New IMPROVE Equation													
Voyageurs	0.114		17.44										
BWCA	0.129		17.53										
Isle Royale	0.133		18.61										
Seney	0.183		21.23										

Notes: (1) BWCA values for 2002 - 2004 reflect "substituted" data.
(2) Natural haze levels II taken from July 2006 PowerPoint presentation by Natural Haze Levels II Committee
(3) URP (uniform rate of progress) = (baseline - natural conditions)/(2064-2002)

3. Evaluation of control measure effectiveness

   a. What tools are available to evaluate the effectiveness of emission reductions?

      USEPA's modeling guidelines[4] recommend using air quality models, along with complementary analyses of ambient monitoring, emissions, and meteorological data to determine whether a given control strategy meets the air quality goal. The Midwest RPO is using CAMx for its regional, multi-pollutant air quality modeling, and CENRAP is using both CMAQ and CAMx for its regional haze modeling. Both models have been shown to provide reasonable estimates for sulfates and can, therefore, be used to examine sulfate control strategies. The models are less reliable for nitrates and organic carbon. To compensate for model uncertainty and to provide a more robust visibility assessment, additional information should be considered as part of a weight-of-evidence demonstration (see, for example, results of ambient data analyses in Figure 8 below).

   b. How effective will existing ("on the books") controls be in improving visibility in the northern class I areas?

      Air quality modeling was conducted by the Midwest RPO to assess future year visibility levels based on the following existing ("on the books") controls:

      On-Highway Mobile Sources
      - Tier II/Low sulfur fuel
      - Inspection/Maintenance programs (nonattainment areas)
      - Reformulated gasoline (nonattainment areas)

      Off-Highway Mobile Sources
      - Federal control programs incorporated into NONROAD model (e.g., nonroad diesel rule), plus the evaporative Large Spark Ignition and Recreational Vehicle standards
      - Heavy-duty diesel (2007) engine standard/Low sulfur fuel
      - Federal railroad/locomotive standards
      - Federal commercial marine vessel engine standards

      Power Plants
      - Title IV (Phases I and II)
      - NOx SIP Call
      - Clean Air Interstate Rule
      - Clean Air Mercury Rule

      Other Point Sources
      - VOC 2-, 4-, 7-, and 10-year MACT standards
      - Combustion turbine MACT
      - Industrial boiler/process heater/RICE MACT

      The model results for this scenario (and other control scenarios, which are discussed further below) are provided in Table 2 and Figures 5 and 6. (Note, Table 2 and Figure 5 also include results for a scenario based on existing controls and BART. The assumed BART controls reflect preliminary information on BART facilities and possible emission reductions. Further review of the affected BART facilities and actual emission reductions is necessary.) As can be seen, even with these control programs fully implemented in 2018, the projected visibility levels are above the uniform rate of progress line.

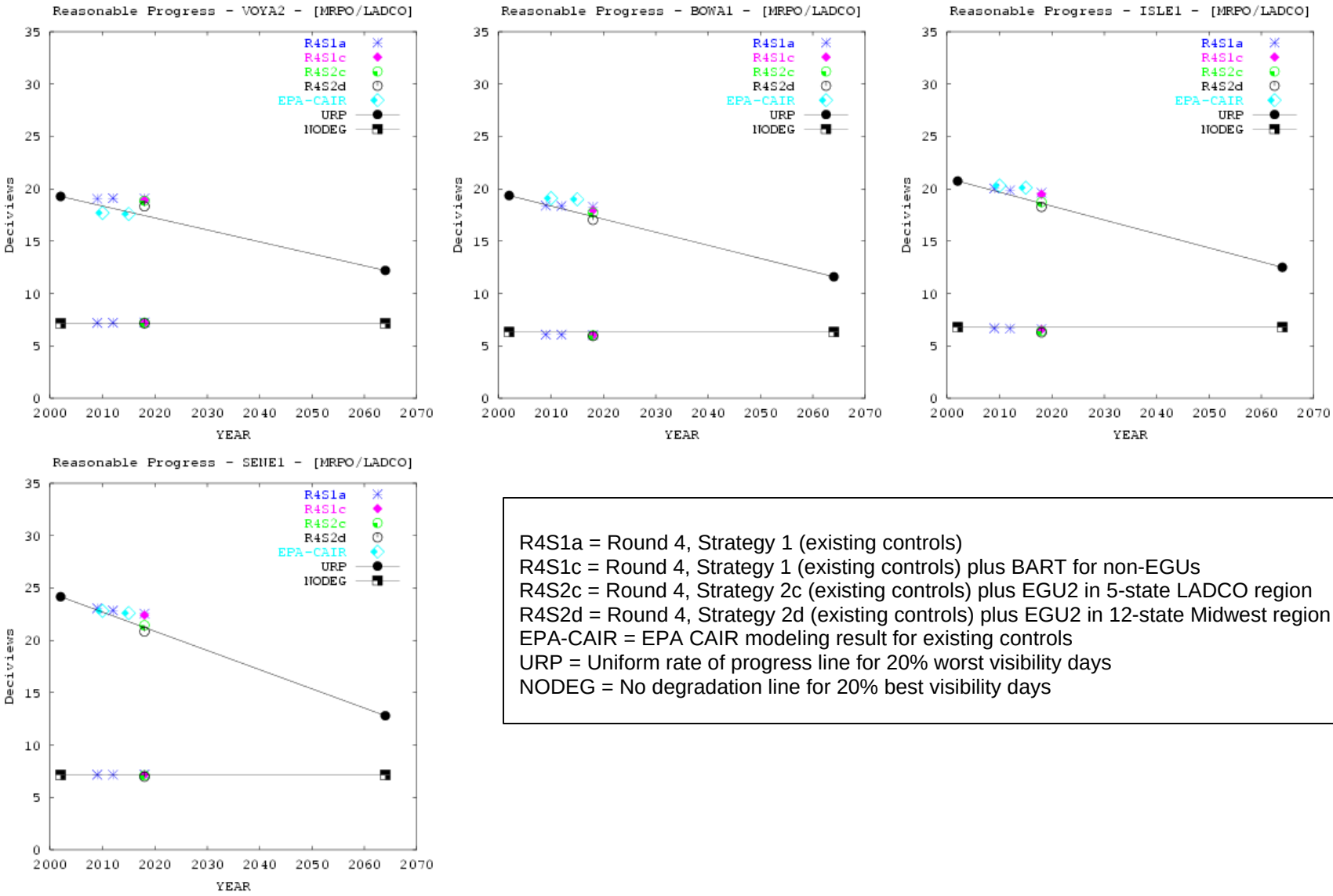
[4] "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze", Draft 3.2, September 2006

Table 2. Summary of Midwest RPO Round 4 Modeling for Class I Areas in Eastern U.S.

		Baseline	2018		2009	2012	2018	2018	2018	2018
Site	**Type**	**DV**	**Goal**		**R4S1a**	**R4S1a**	**R4S1a**	**R4S1c**	**R4S2c**	**R4S2d**
					Existing Controls	Existing Controls	Existing Controls	Existing Controls + BART	Existing Controls + EGU2 in 5-State LADCO Region	Existing Controls + EGU2 in 12-State Midwest Region
VOYA2	Worst 20%	19.27	17.44		19.05	19.10	19.09	18.93	18.86	18.32
BOWA1	Worst 20%	19.35	17.35		18.39	18.36	18.29	17.94	17.73	17.03
ISLE1	Worst 20%	20.74	18.61		20.03	19.86	19.63	19.48	18.73	18.27
SENE1	Worst 20%	24.16	21.23		23.06	22.84	22.54	22.40	21.44	20.84
BRIG1	Worst 20%	29.01	24.69		25.69	25.01	24.05	24.02	23.48	23.02
MACA1	Worst 20%	31.37	26.17		27.62	26.58	25.02	24.96	23.73	22.07
MING1	Worst 20%	29.54	25.14		27.18	26.83	26.28	26.23	25.37	24.61
SHEN1	Worst 20%	29.31	24.69		24.03	22.76	21.55	21.49	20.40	19.41
DOSO1	Worst 20%	29.04	24.23		24.81	23.47	22.28	22.23	21.44	19.94
LYBR1	Worst 20%	24.45	21.21		22.16	21.69	21.11	21.07	20.56	20.17
VOYA2	Best 20%	7.14	7.14		7.19	7.20	7.23	7.17	7.21	7.15
BOWA1	Best 20%	6.33	6.33		6.07	6.07	6.03	6.00	6.01	5.94
ISLE1	Best 20%	6.77	6.77		6.68	6.65	6.62	6.56	6.41	6.27
SENE1	Best 20%	7.14	7.14		7.16	7.16	7.21	7.16	7.10	6.97
BRIG1	Best 20%	14.33	14.33		13.80	13.74	13.55	13.52	13.38	13.26
MACA1	Best 20%	16.51	16.51		16.12	16.01	15.72	15.67	15.30	14.88
MING1	Best 20%	13.67	13.67		13.24	13.18	13.18	13.15	12.95	12.51
SHEN1	Best 20%	10.93	10.93		9.78	9.59	9.22	9.21	9.08	8.92
DOSO1	Best 20%	12.28	12.28		11.65	11.40	11.17	11.14	10.91	10.64
LYBR1	Best 20%	6.36	6.36		6.12	6.06	5.97	5.96	5.90	5.84

Notes: (1) Model results are expressed in deciviews, and were processed using the new IMPROVE equation.

(2) EGU1, EGU2 represent more stringent SO2 and NOx emission requirements for power plants (see Midwest RPO EGU White Paper).



R4S1a = Round 4, Strategy 1 (existing controls)
R4S1c = Round 4, Strategy 1 (existing controls) plus BART for non-EGUs
R4S2c = Round 4, Strategy 2c (existing controls) plus EGU2 in 5-state LADCO region
R4S2d = Round 4, Strategy 2d (existing controls) plus EGU2 in 12-state Midwest region
EPA-CAIR = EPA CAIR modeling result for existing controls
URP = Uniform rate of progress line for 20% worst visibility days
NODEG = No degradation line for 20% best visibility days

Figure 5. Uniform rate of visibility improvement for 20% worst and 20% best days (Midwest RPO Round 4 Modeling)

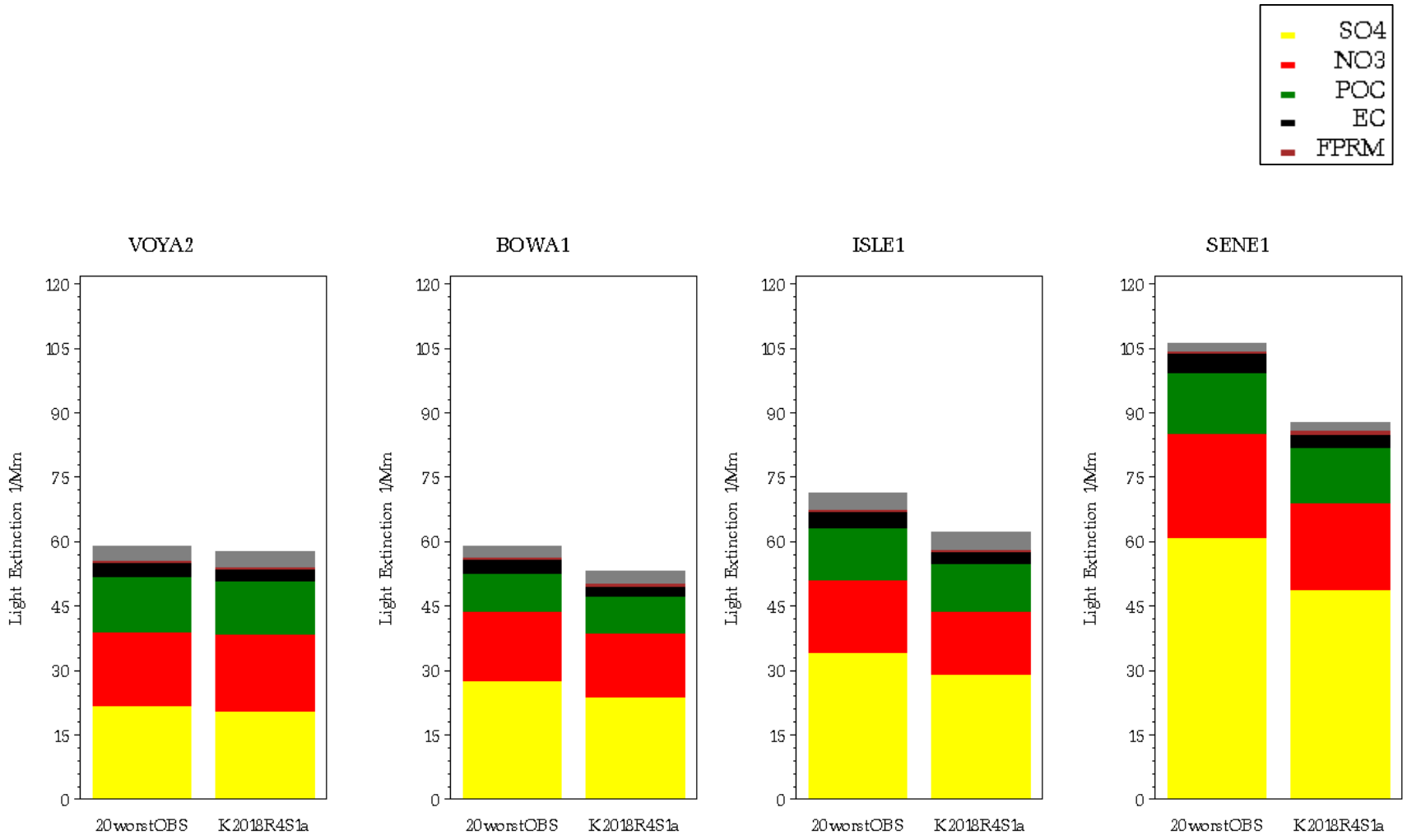


Figure 6. 2002 base year v. 2018 future year visibility levels (Midwest RPO Round 4 Modeling)

c. What additional control measures will be effective in improving visibility in the northern class I areas?

The Midwest RPO's air quality modeling also examined several additional control measures, as summarized below.

Sulfate Control Strategies: Reductions in SO2 emissions will decrease sulfate concentrations. Most the SO2 emissions in the upper Midwest are from EGUs. As such, additional EGU SO2 control measures were examined. In particular, the SO2 emission targets identified in the Midwest RPO's White Paper for EGUs were modeled:

	SO2 (lb/MMBTU)	NOx (lb/MMBTU)
EGU1	0.15	0.10
EGU2	0.10	0.07

The modeling shows that these controls will improve visibility in the northern class I area for both the 20% worst and 20% best days (see Table 2 and Figure 5). There is more improvement with greater emission reduction (e.g., EGU2 provides more benefit than EGU1) and with greater spatial coverage (e.g., 12-state control program provides more benefit than 5-state control program).

Nitrate Control Strategies: Reductions in NOx emissions will decrease nitrate concentrations. NOx emissions in the upper Midwest are from a variety of sources, principally, mobile sources (on-road and off-road) and stationary sources (EGUs and non-EGUs). The modeling for EGU1 and EGU2 reflect the lower NOx emission limitations. No additional NOx-specific strategies have been modeled by the Midwest RPO to address regional haze at this time.

To determine whether these additional control measures satisfy the requirement for reasonable progress, an assessment of four factors is needed (i.e., costs of compliance, time necessary for compliance, energy and non-air quality environmental impacts, and remaining useful life). The Midwest RPO and the State of Minnesota are currently cooperating on this assessment. Draft results for several candidate control measures are expected in early 2007.

Although organic carbon is also an important contributor to visibility impairment, no organic carbon control strategies were considered for the following reason. A special study was performed in Seney to identify sources of organic carbon (Cite: "Source Apportionment of Atmospheric Fine Particulate Matter Collected at the Seney National Wildlife Refuge", May 2004, UW-Madison). As seen in Figure 7, the highest $PM_{2.5}$ concentrations occurred during the summer, with organic carbon being the dominant species. The higher summer organic carbon concentrations were attributed mostly to secondary organic aerosols of biogenic origin because of the lack of primary emission markers in the summer[5], and concentrations of known biogenic-related species (e.g., pinonic acid) were also higher during the summer. Thus, the organic carbon contribution in the northern class I areas is considered to be largely uncontrollable.

[5] Analysis of primary source emission markers and chemical mass balance modeling of the Seney data showed that the impact of primary emission sources (e.g., biomass burning, motor vehicles, and road dust) was fairly low. Biomass burning, in particular, contributed less than 1% on an annual average basis, although episodic impacts were found (e.g., see high organic carbon days in Figure 3).

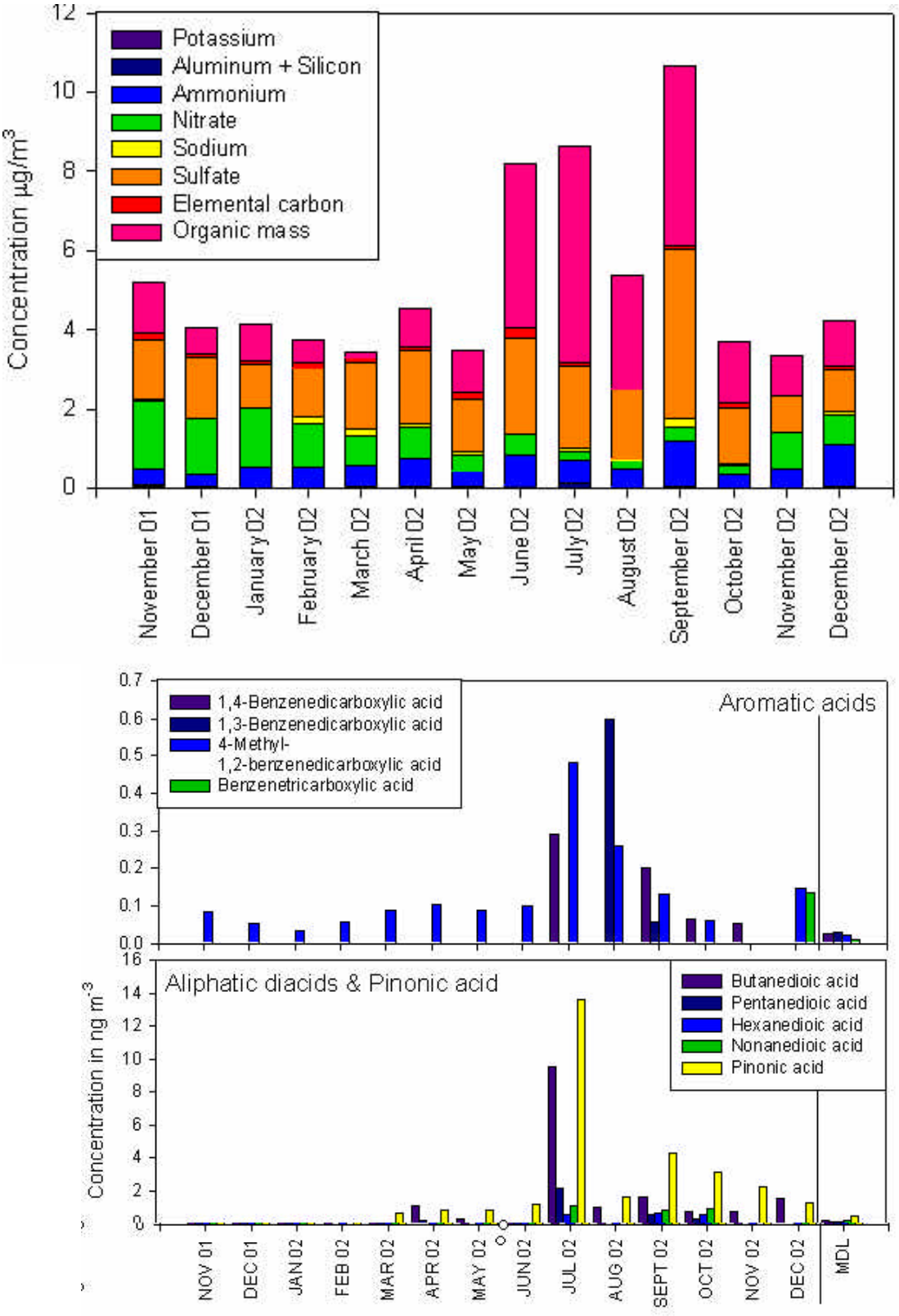


Figure 7. Monthly concentrations of $PM_{2.5}$ species (top) and biogenic-related organic carbon species in Seney (bottom)

d. Should we consider control measures for ammonia?

Technical analyses have shown that $PM_{2.5}$ concentrations will respond to reductions in sulfate, nitrate (nitric acid), and ammonia – see, for example, plots in Figure 8 based on data from the Great River Bluffs, MN site in the Midwest regional ammonia network (Cite: "Draft Final Technical Memorandum, Analysis of Data from the Midwest Ammonia Monitoring Project", March 31, 2005, C. Blanchard and S. Tannenbaum). Thus, ammonia emission reductions will lower $PM_{2.5}$ concentrations and improve visibility levels in the northern class I areas. (Note that current regional inventories show most ammonia emissions come from livestock waste and fertilizer applications.)

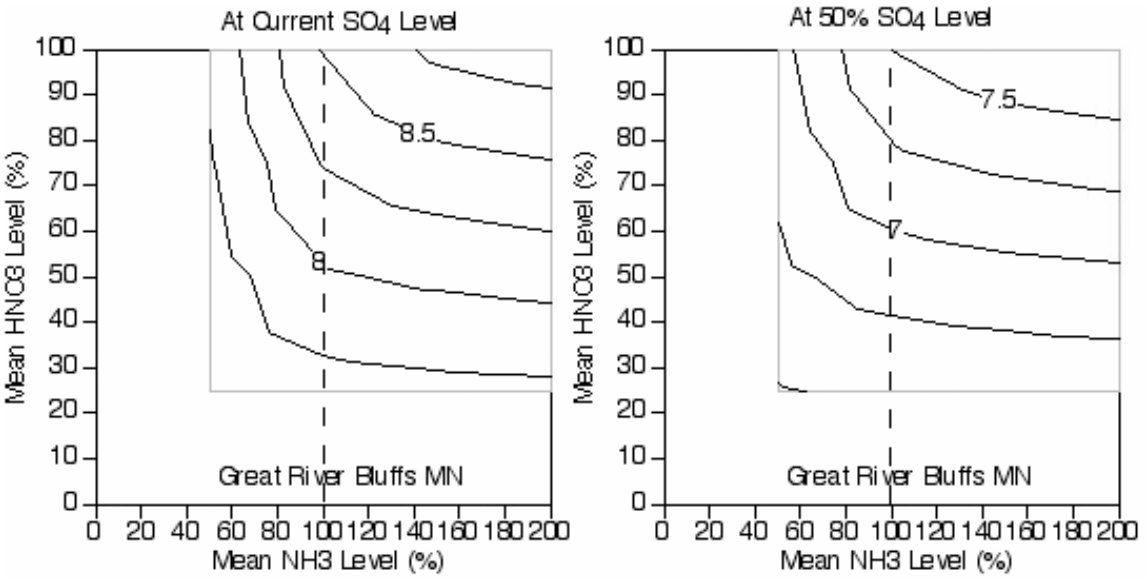


Figure 8. Predicted $PM_{2.5}$ mass concentrations at Great River Bluffs, MN as functions of changes in ammonia and nitric acid at fixed sulfate levels

In deciding whether to pursue control measures for ammonia, several issues need to be taken into account. First, there are technical uncertainties, including the reliability of emission estimates, treatment of ammonia by current photochemical modeling systems, and lack of ambient measurements. It is worth noting, however, that the Midwest RPO and CENRAP have attempted to address these uncertainties by supporting development of a new process-based emissions model, conducting model sensitivity studies of ammonia deposition, and collecting ambient ammonia data as part of the Midwest regional ammonia network. Second, as noted by USEPA in its final CAIR rulemaking, "reductions in ammonia emissions alone would also tend to increase the acidity of PM2.5 and precipitation…. this might have untoward environmental or health consequences."

APPENDIX
Contribution Assessment for Northern Class I Areas

Air quality data analyses involving back trajectories[6], dispersion modeling, and emissions inventories were examined to provide information on source region and source sector contributions to regional haze in the northern class I areas. Based on this information, the following key findings should be noted:

- The most important contributing states are Michigan, Minnesota, and Wisconsin, as well as North Dakota, Iowa, and Illinois.

- The most important contributing pollutants and source sectors are SO2 emissions from electrical generating units (EGUs), which lead to sulfate formation, and NOx emissions from a variety of source types (e.g., motor vehicles), which lead to nitrate formation. Ammonia emissions from livestock waste and fertilizer applications are also important, especially for nitrate formation.

LACO Back Trajectory Analysis (1997-2001 Data)
The first data analysis study consists of back trajectories using data for 1997-2001 (all sampling days), a start height of 200 m, and a 72-hour (3-day) trajectory period (Cite: "Quantifying Transboundary Transport of PM2.5: A GIS Analysis", May 2003, LADCO). By combining trajectory frequencies with concentration information, the average contribution to $PM_{2.5}$ mass and individual $PM_{2.5}$ species was estimated (which, in turn, was used to estimate the average contribution to light extinction). The results for three northern class I areas are provided in Table 1 for the 20% best days, all days, and 20% worst days. The tables shows that the most important contributing states are Michigan, Minnesota, and Wisconsin, and, to a lesser degree, Illinois, Iowa, Missouri, North Dakota, South Dakota, Ontario, and Manitoba.

LACO Back Trajectory Analysis (2000-2003 Data)
The second data analysis study consists of back trajectories using data for 2000-2003 (20% highest and lowest days), a start height of 200m[7], and a 120-hour (5-day) trajectory period (Cite: "Sensitivity Analysis of Various Trajectory Parameters", June 2005, LADCO). Composite back trajectory plots were prepared for light extinction, sulfate, and nitrate (see Figures 1 and 2). For the high light extinction (poor visibility) and high sulfate and nitrate concentration days, the orange areas are where the air is most likely to come from, and the green areas are where the air is least likely to come from. As can be seen, bad air days are generally associated with transport from Michigan, Minnesota, and Wisconsin, as well as North Dakota, South Dakota, Iowa, Illinois, and Indiana. On the other hand, the good air days (low extinction) are generally associated with transport from Canada.

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[6] Another type of data analysis – receptor modeling – was performed to identify important source sectors. Using statistical tools, the relative contributions associated with various primary and secondary emissions was estimated. Because most of the fine particle mass in these northern class I areas is secondary in nature, the tools were unable to provide much definition - e.g., over 80% of the impacts on the 20% worst visibility days at Voyageurs was due to a combination of secondary sulfate, secondary nitrate, and (mostly secondary) organic carbon. As such, the results of these data analyses are not included here.

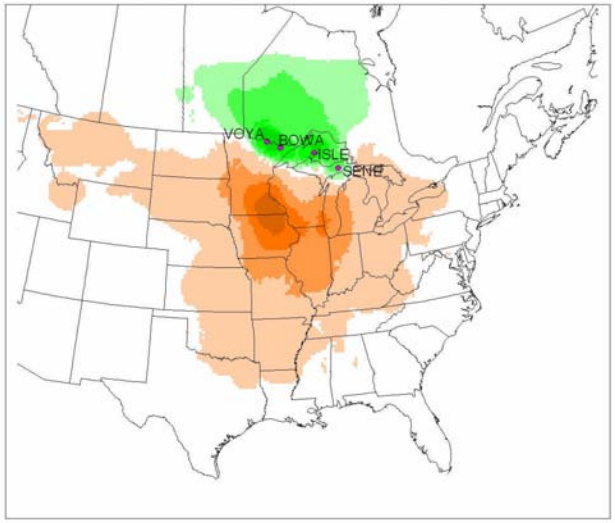
[7] A sensitivity analysis was performed to determine the effect of start height. Increasing westerly influence was seen as start height increases. 200 m was assumed to be an appropriate compromise to represent the mixed boundary layer, but not unduly influenced by surface features.

Table 1. Estimated Contributions to Visibility (Light Extinction) – Percentages

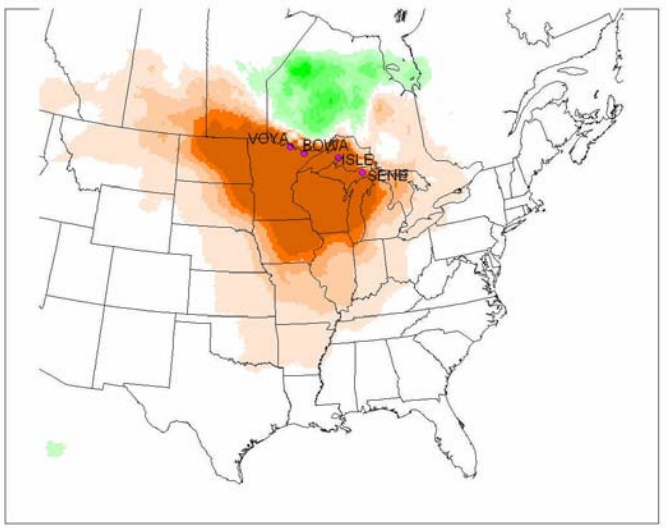
		Boundary Waters Extinction			Voyageurs Extinction			Seney Extinction		
		Best	All Days	Worst	Best	All Days	Worst	Best	All Days	Worst
US	Alabama		0.03						0.20	0.39
	Arkansas		0.30	0.40		0.10	0.19		1.54	2.93
	Florida								0.09	0.17
	Georgia								0.21	0.39
	Illinois		1.68	2.74		0.50	1.22		4.99	7.43
	Indiana		0.57	1.18					1.67	2.17
	Iowa		5.14	7.44		6.12	10.24		5.27	5.66
	Kentucky								1.14	2.18
	Louisiana		0.12	0.23		0.03	0.06		0.78	1.23
	Massachusetts								0.01	
	Michigan	0.78	1.17	0.66	0.27	1.22	1.57	14.51	13.68	14.68
	Minnesota	22.04	34.75	37.63	20.96	34.60	36.88	1.46	5.41	3.79
	Mississippi		0.06						0.62	1.04
	Missouri		2.17	3.26		1.02	0.30		2.42	3.17
	New Hampshire								0.02	
	New York								0.07	0.10
	North Carolina		0.09						0.19	0.36
	North Dakota	1.21	5.13	5.91	1.59	6.51	7.11		1.26	0.64
	Ohio		0.19	0.23				0.07	1.61	2.80
	Pennsylvania							0.49	0.15	0.26
	South Carolina								0.21	0.39
	South Dakota	0.45	3.06	4.38		4.08	6.93		1.13	1.12
	Tennessee		0.01						0.47	0.85
	Vermont								0.02	
	Virginia		0.03						0.17	0.33
	West Virginia		0.05						0.54	1.02
	Wisconsin	1.31	7.86	10.06		5.50	9.66	0.26	10.63	8.44
	Western States	1.10	4.31	5.74		7.05	9.53		5.80	5.90
Canada	Manitoba	9.95	7.45	3.71	17.65	10.35	6.04	3.77	2.37	0.77
	Ontario	47.52	15.96	8.92	49.56	13.59	4.98	50.97	12.86	7.66
	Quebec	1.77	0.15		0.21	0.01		0.97	0.93	0.41
	Other Provinces	2.27	3.73	2.46	6.05	6.29	2.35	0.86	1.72	2.28
Other (over water, etc.)		11.61	6.02	5.05	3.72	3.05	2.94	26.65	21.86	21.44
Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: Because Seney is more surrounded by water (the Great Lakes) than the other monitoring sites, the analysis shows greater impacts associated with the Other (over water) category. Actually, most of the Other (over water) impacts at Seney are from nearby (over land) emission sources, not over water emission sources.

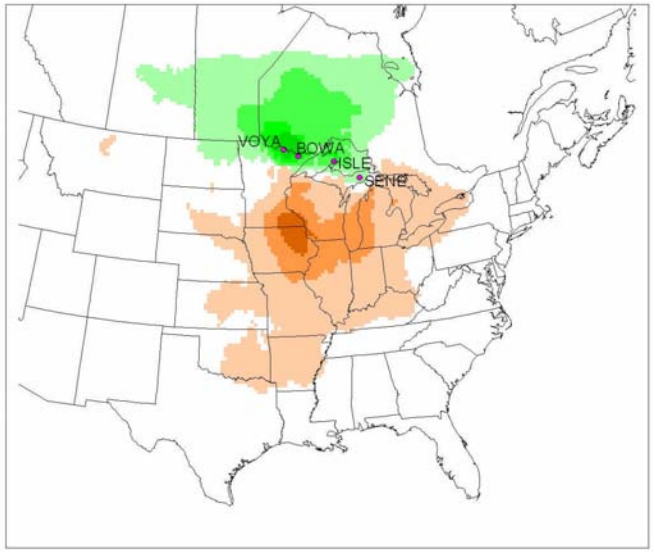
Figure 1. Composite back trajectories for light extinction, sulfates, and nitrates



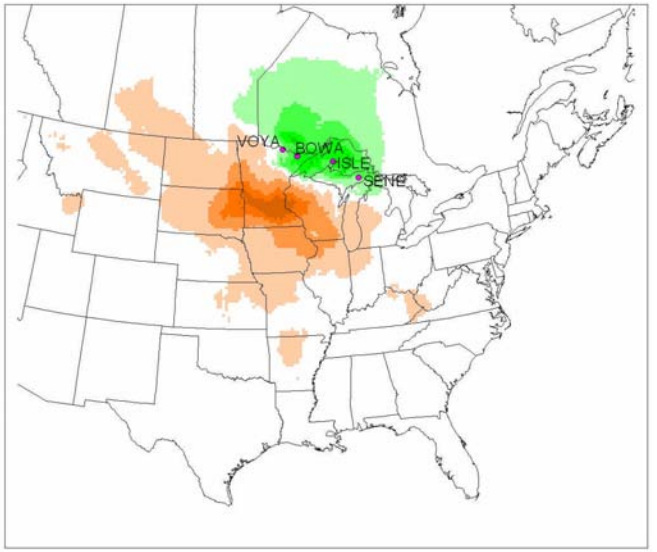
High extinction days – orange is where air is most likely to come from on poor air quality days, green is where air is least likely to come from on poor air quality days



Low extinction days – green is where are is most likely to come from on good air quality days, orange is where air is least likely to come from on good air quality days

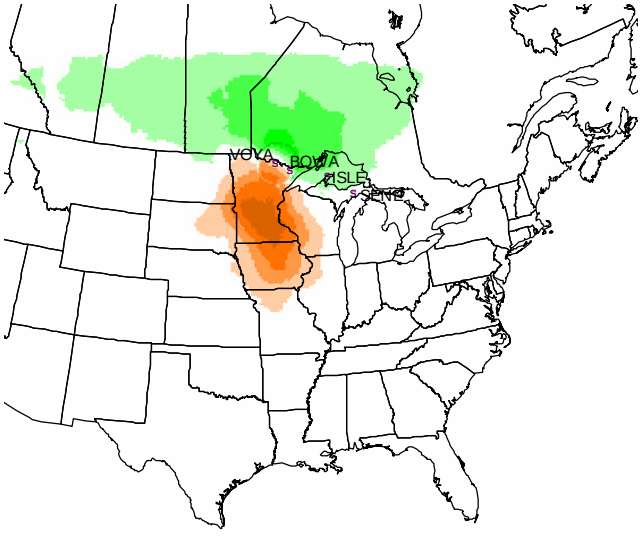


High sulfate concentration days

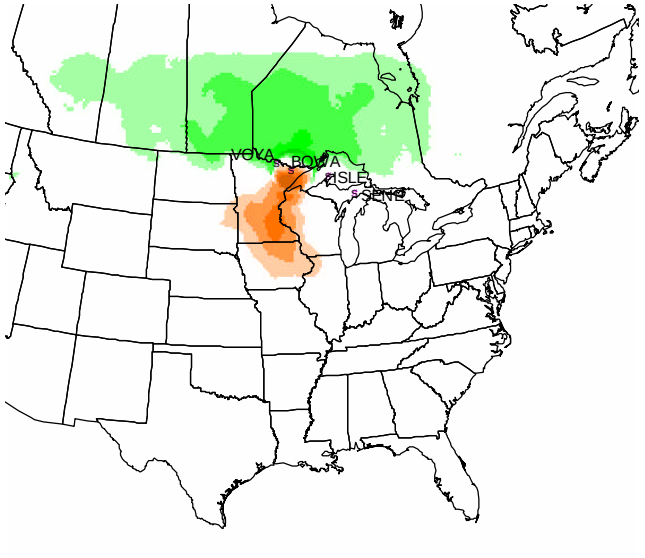


High nitrate concentration days

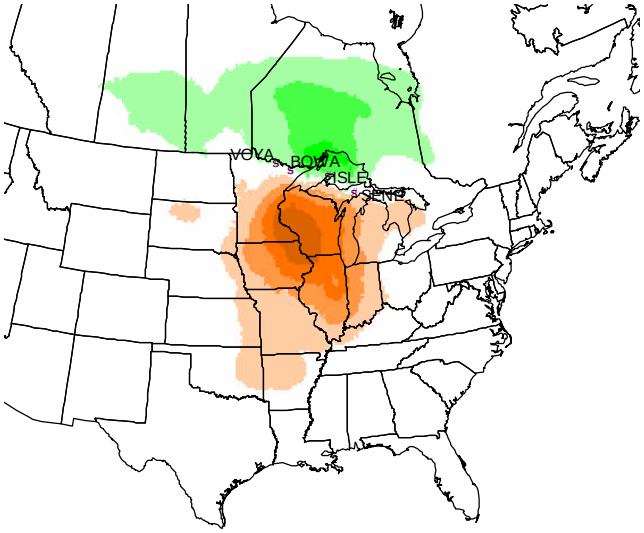
Figure 2. Back trajectories for light extinction for each class I area



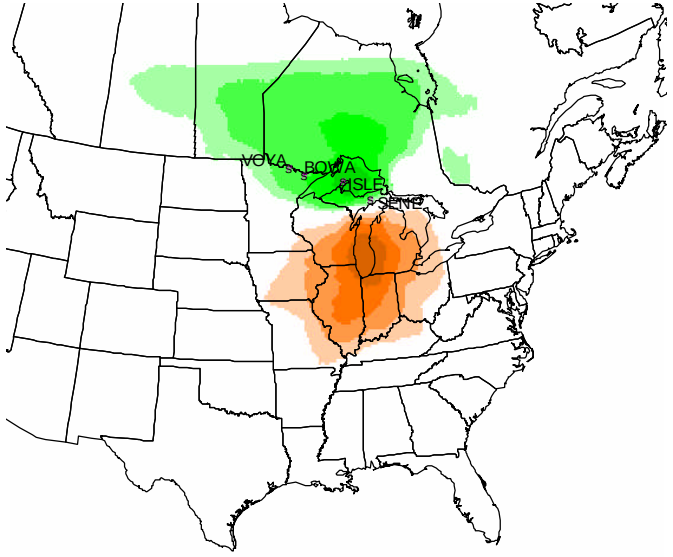
Voyageurs



Boundary Waters



Isle Royale



Seney

CENRAP Areas of Influence Assessment Using Back Trajectories and Other Tools

The third data analysis study involves an assessment of Areas of Influence (AOI) using several back trajectory analyses, including Residence Time Difference Plots, the Probability of Regional Source Contribution to Haze plots, and Tagged Species Source Apportionment Results (Cite: "CENRAP Regional Haze Control Strategy Analysis Plan", May 9, 2006, Alpine Geophysics). AOIs were constructed for 10 class I areas in the CENRAP region, including Boundary Waters/Voyageurs (see Figure 3). Green contours represent AOIs for nitrates, and red contours represent AOIs for sulfates. Similar to LADCO's composite trajectory plots in Figure 1, nitrate impacts are associated with more westerly transport, while sulfate impacts are associated with more southerly transport.

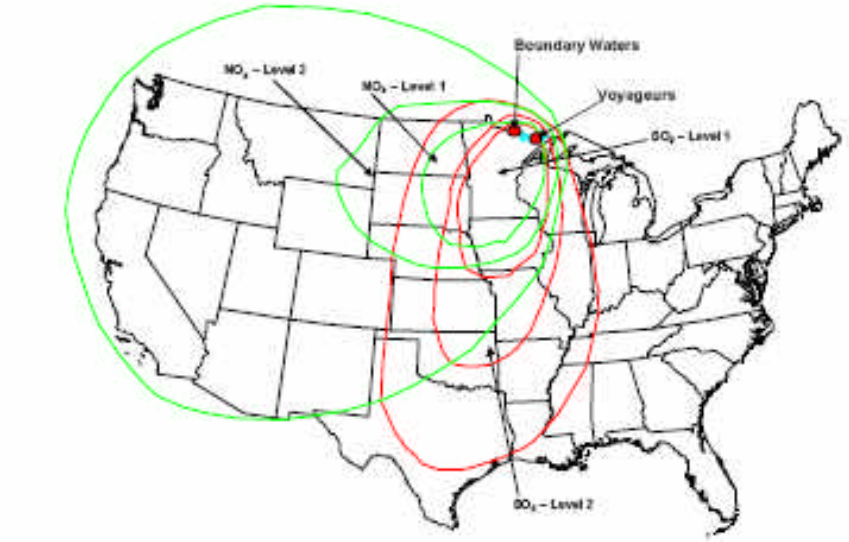


Figure 3. AOIs for nitrates and sulfates for Boundary Waters/Voyageurs

CENRAP Emissions Inventory Potential Analysis

The fourth data analysis study combines back trajectories with emissions inventory data to estimate the Emissions Impact Potential (EIP). This approach weights emissions at a particular location by the probability of transport from that location to a given receptor under days of high sulfate or nitrate concentrations. The EIP results for SO2 and NOx for Voyageurs, which are provided in Figure 4, show that contributions are greatest from source regions in northeastern Minnesota and the Twin Cities urban area.

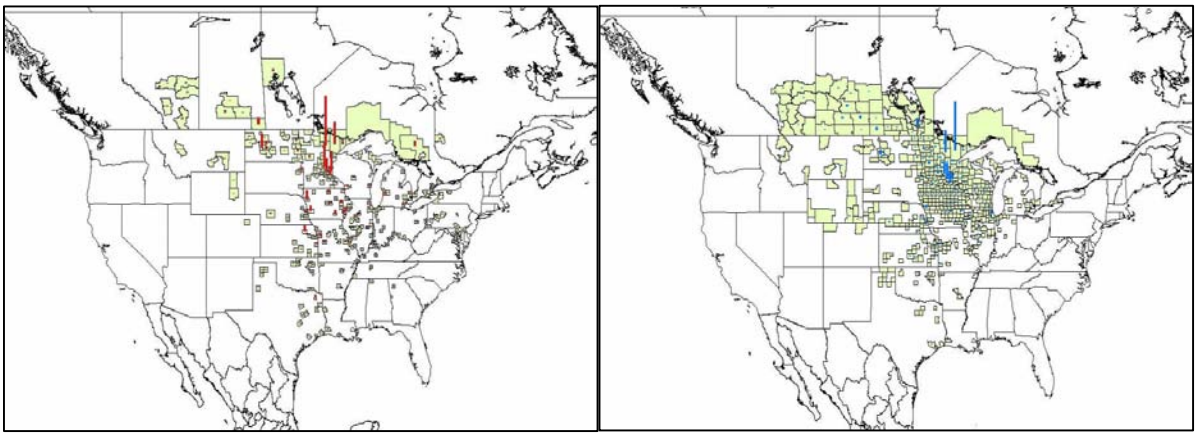


Figure 4. EIP for SO2 (left) and NOx (right) as calculated for Voyageurs

Dispersion Modeling Studies: MPCA (2002) and LADCO (2018)

The dispersion modeling studies rely on the particle source apportionment tool (PSAT) in CAMx. One PSAT analysis was conducted by the Minnesota Pollution Control Agency (MPCA) using the Base K/Round 4 emissions inventory for 2002 and another PSAT analysis was conducted by LADCO using the Base K/Round 4 emissions for 2018 ("on the books" controls). MPCA's 2002 analysis included 19 source regions and LADCO's 2018 analysis included 18 source regions (see Figure 5). Both analyses included similar source groups: EGU point, non-EGU point, on-road, nonroad, area, and ammonia.

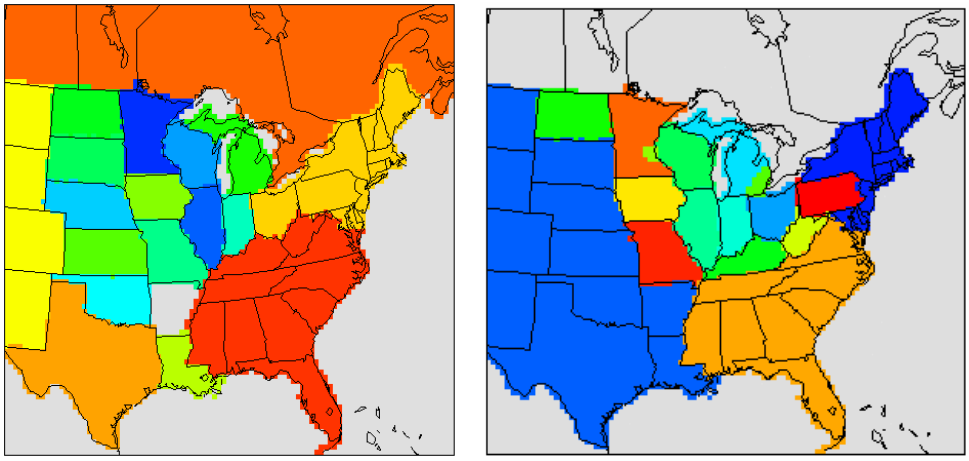


Figure 5. Source regions in MPCA's analysis (left) and LADCO's analysis (right). Contiguous areas of the same color represent a source region.

The contributions to light extinction on the 20% worst visibility days at each of the four class I areas are shown in Figures 6 – 9. A few comments on these results should be noted:

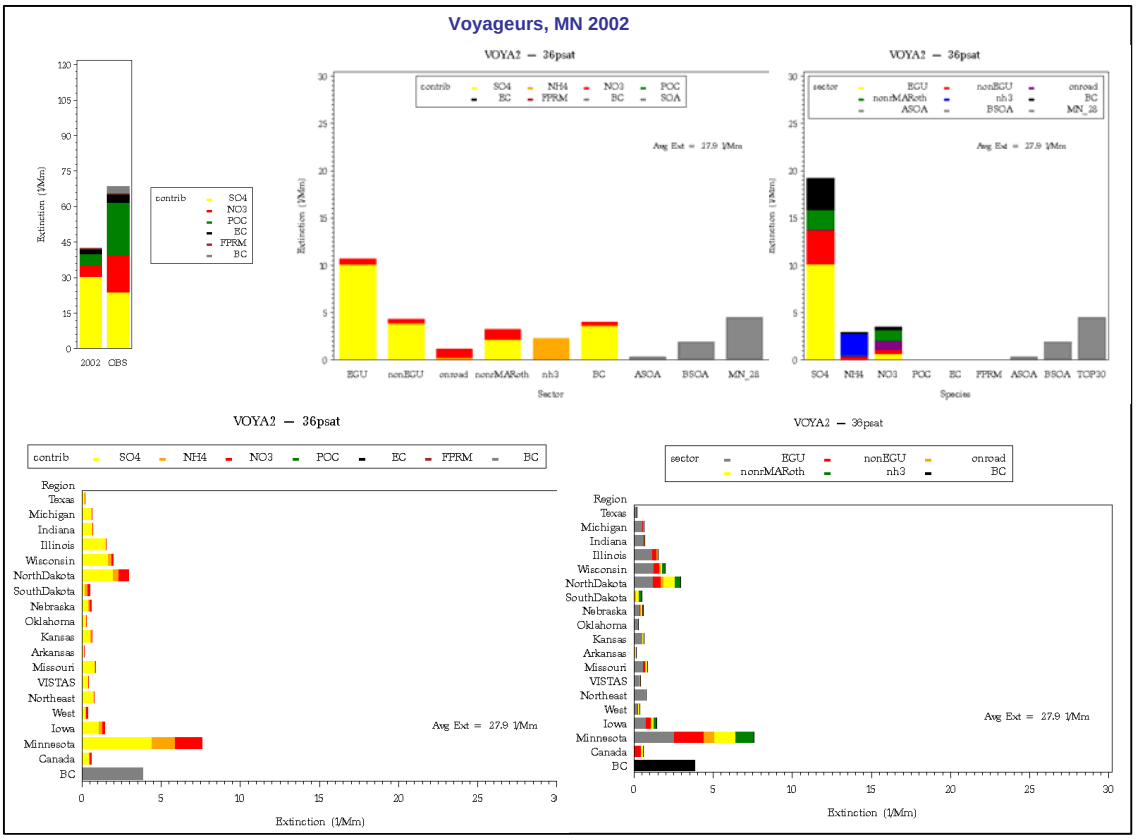
- Source apportionment differs from source response. The source apportionment results represent how much a given source sector and source region contribute to light extinction, whereas the source response is how much light extinction changes due to changes in emissions from a given source sector and source region.

- The bar chart in the upper left hand corner of each figure compares the base year (2002) absolute modeled and observed light extinction values. As can be seen, there is good agreement for sulfates, but not for nitrates or organic carbon. This may be due to emissions or chemistry problems. This underestimation for nitrates and organic carbon should be kept in mind when considering the absolute modeled values for these species.

- The source sector and source region contributions are similar for 2002 and 2018.

- Sulfate impacts are dominated by point source (EGU and non-EGU) SO2 emissions. Nitrate impacts, which as noted above are underestimated, are due to a variety of source sectors.

- The contributions in the two Minnesota class I areas are dominated by emissions from Minnesota, while the contributions in the two Michigan class I areas come from several northern and midwest states.



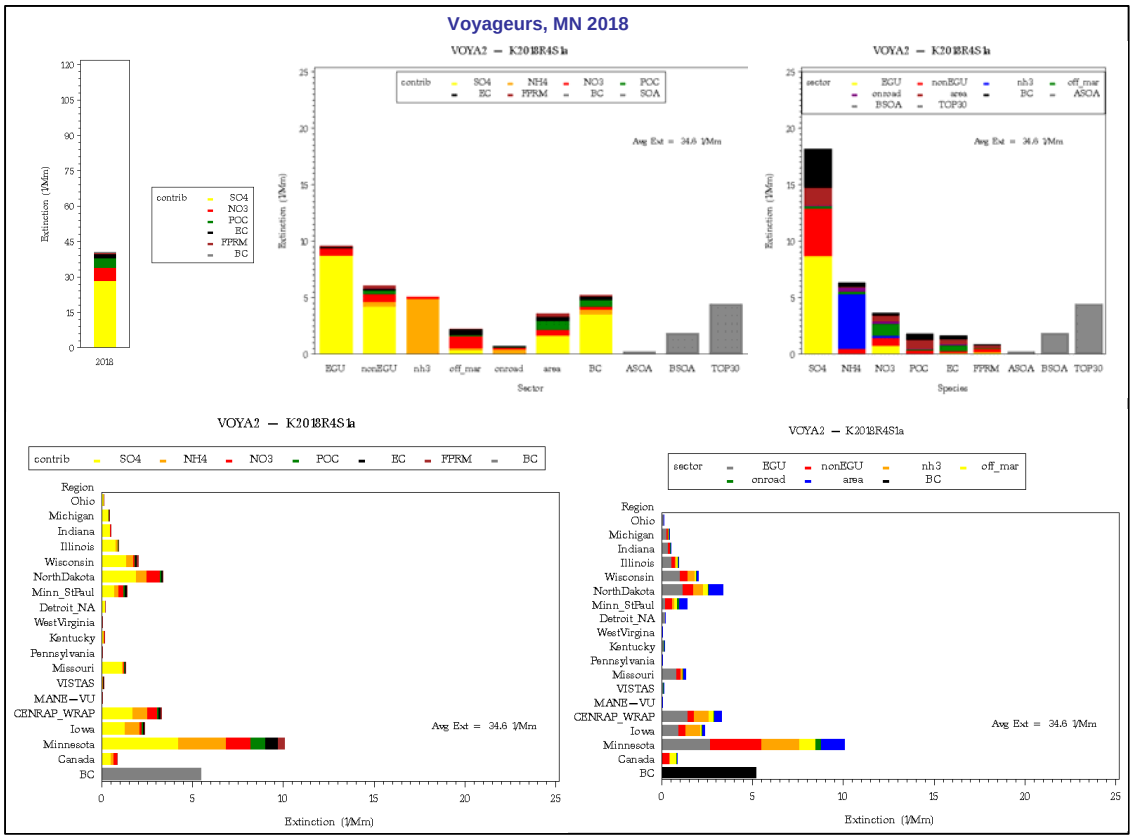
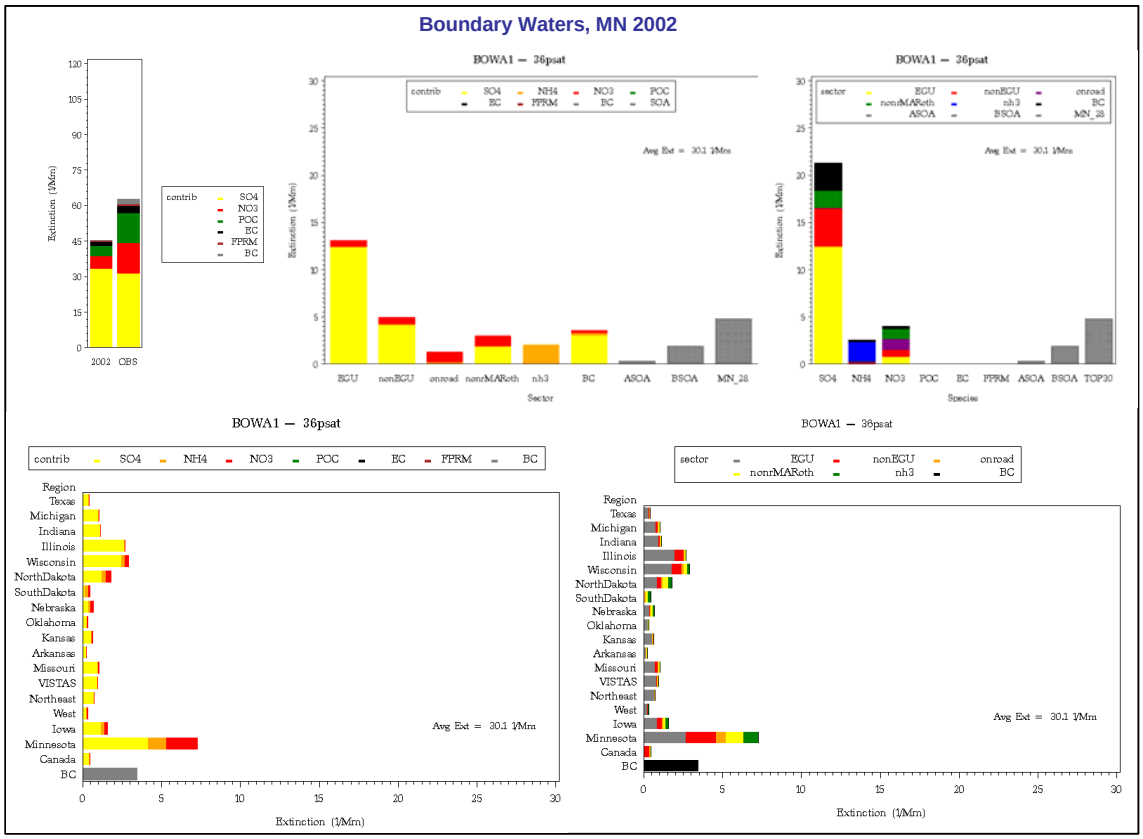


Figure 6. Model-based source apportionment for 20% worst days – Voyageurs



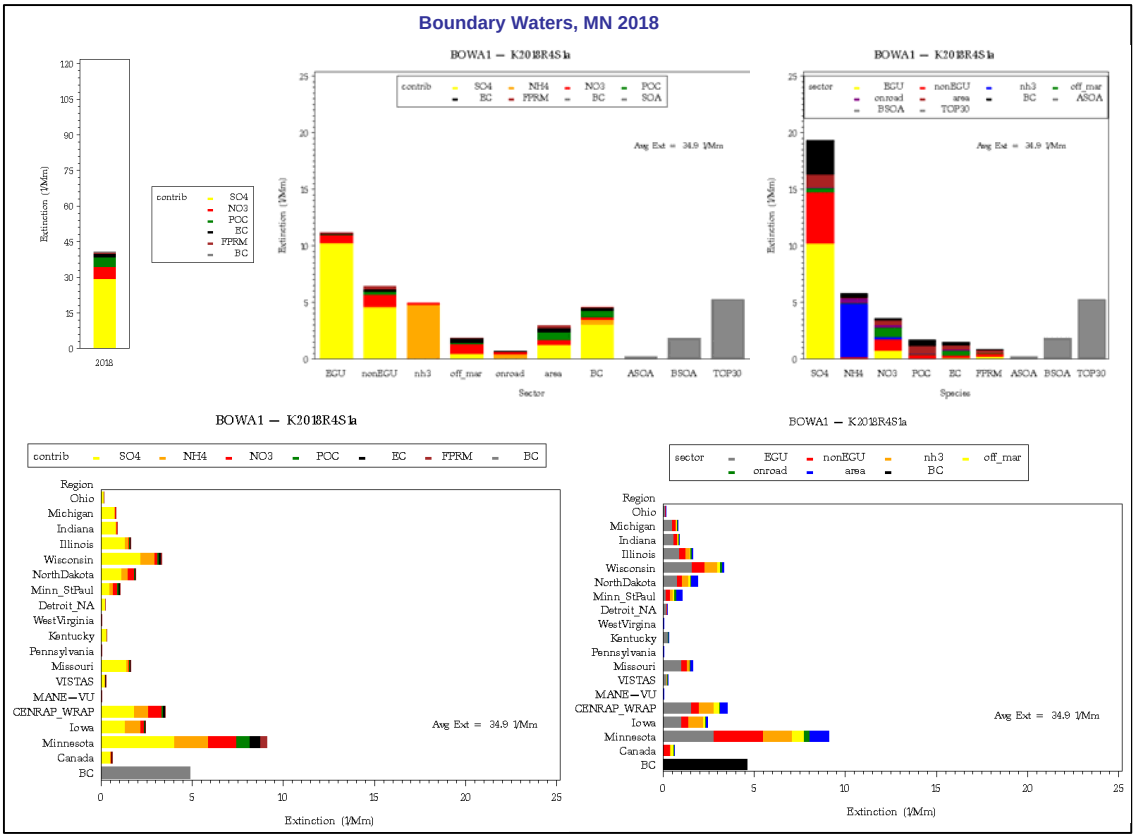
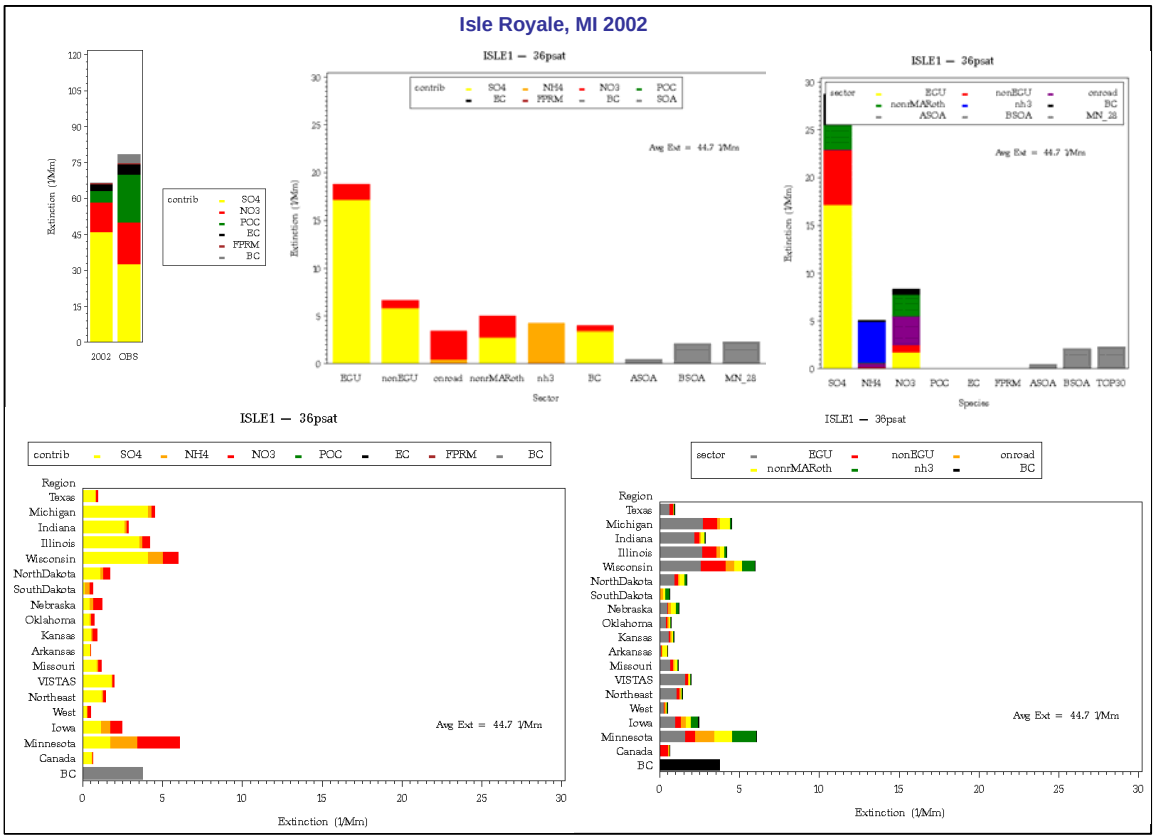


Figure 7. Model-based source apportionment for 20% worst days – Boundary Waters



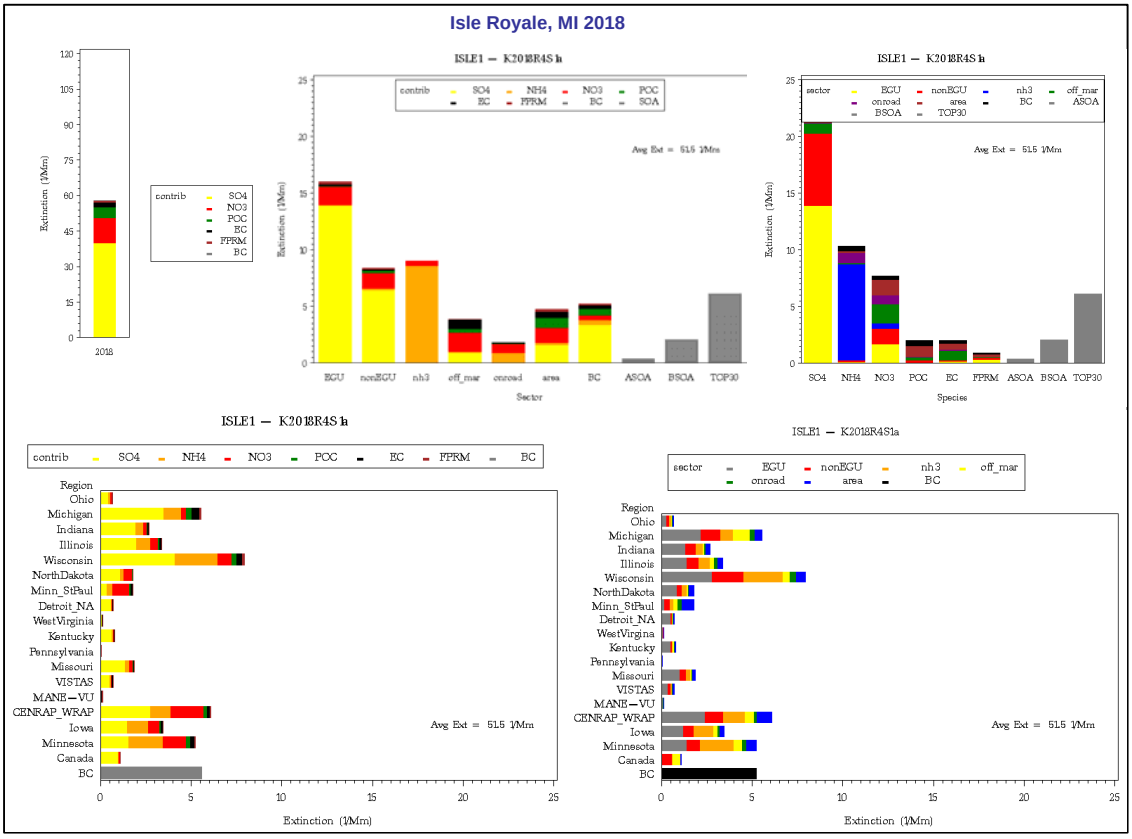
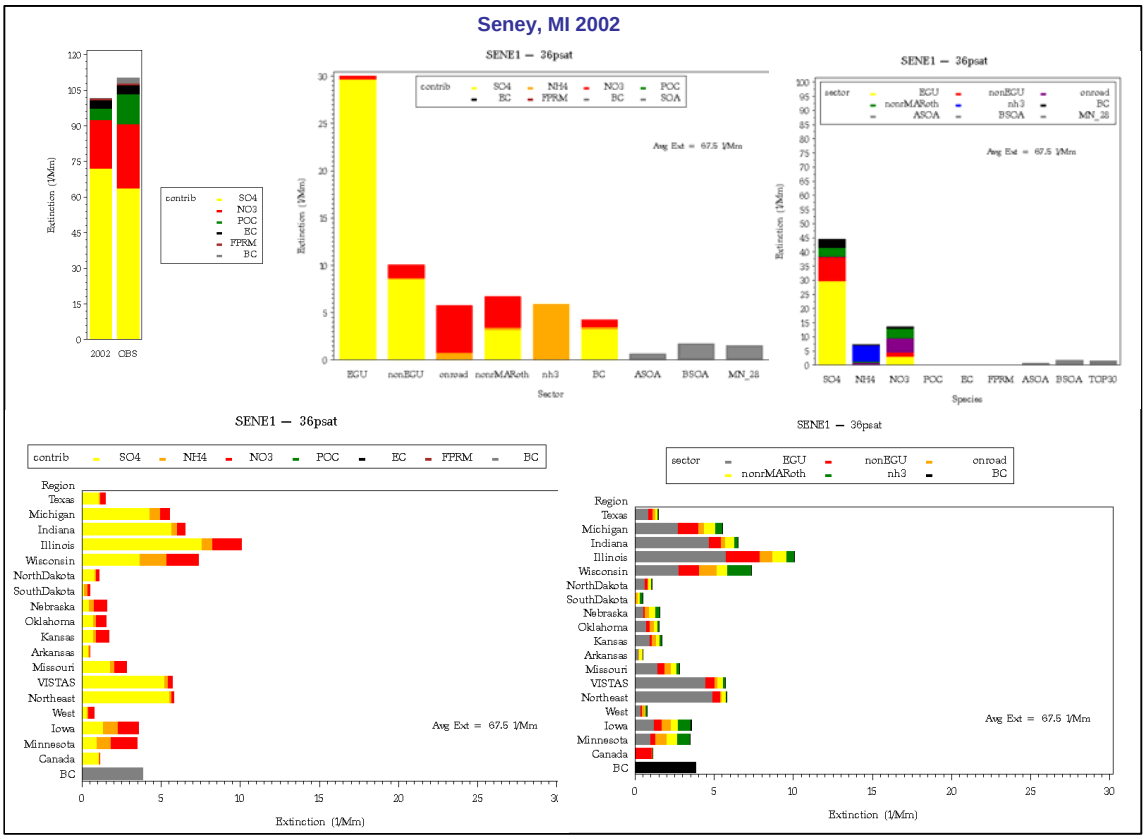


Figure 8. Model-based source apportionment for 20% worst days – Isle Royale



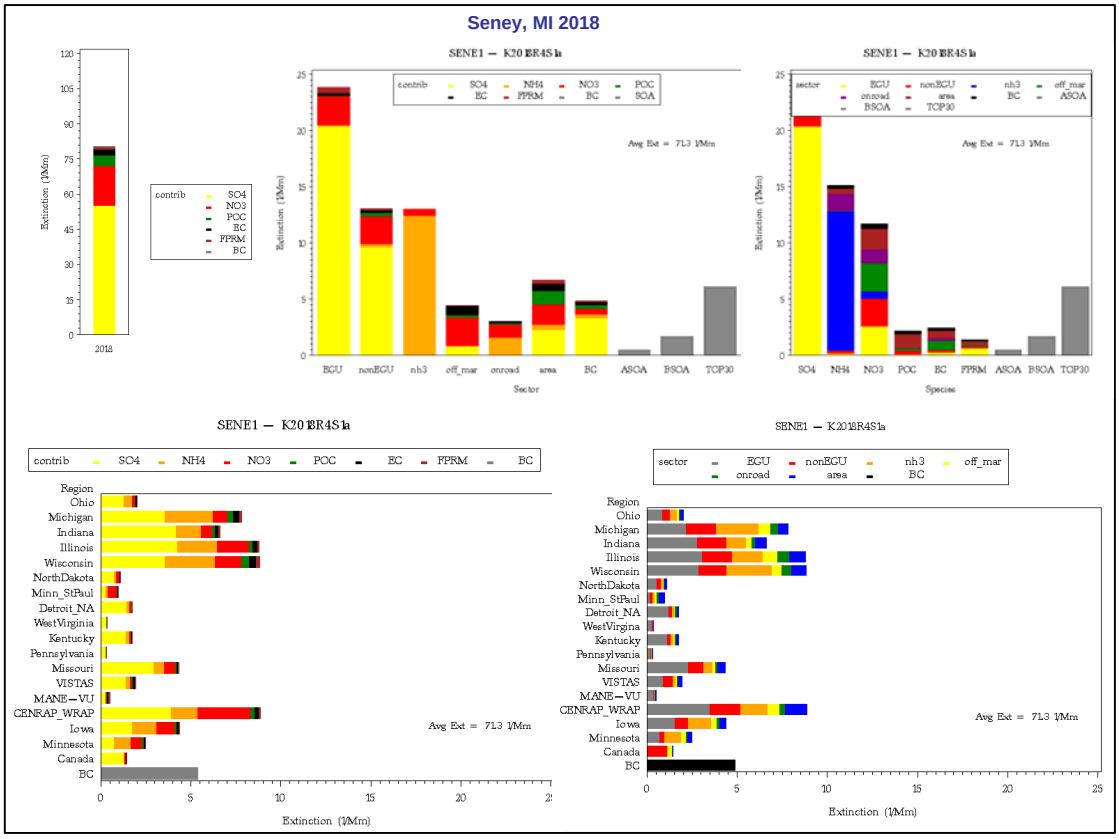


Figure 9. Model-based source apportionment for 20% worst days – Seney

LADCO Emissions Inventory Comparison

Emissions inventories were examined for the northern states which have the greatest impact on the northern class I areas (i.e., Michigan, Wisconsin, and Minnesota). The sector-level emissions for 2002, 2009, 2012, and 2018 are presented in Figure 10.[8] The future year SO2 emissions are dominated by EGUs, suggesting that an SO2 emission reduction strategy, which is needed to reduce sulfate concentrations, should focus on control measures for EGUs. The future year NOx emissions come from a variety of sources, suggesting that a NOx emission reduction strategy, which is needed to reduce nitrate concentrations, may need to consider control measures for a variety of source sectors.

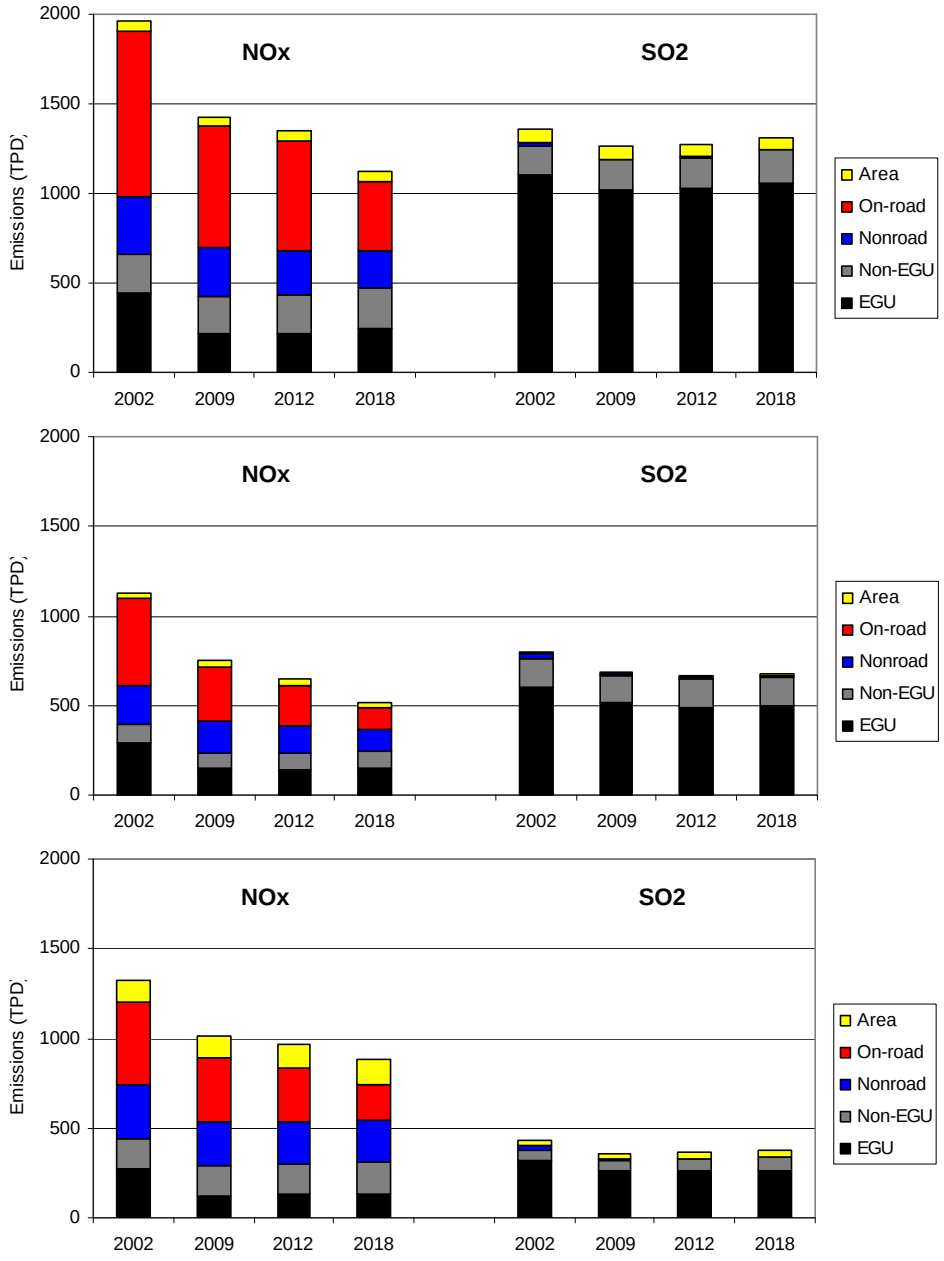


Figure 10. Emissions for Michigan (top), Wisconsin (middle), and Minnesota (bottom) - Base K/Round 4

[8] It is worth noting that the base year (2002) NOx and SO2 emissions for the adjacent Canadian province (Ontario) are considerably less than the combined NOx and SO2 emissions for the three northern states.

APPENDIX F

BART-Eligible and BART-Subject Facilities

Table AI-1: BART-Eligible Sources in Michigan

Source Name	Unit Desp.	SIC	Category
Cargill Salt	Spreader Stroker Boiler	2899	22
	Pulverized Coal Boiler	2899	22
Chrysler - Trenton Engine	#5	3714	22
Delphi Saginaw Steering	Boiler #5	3714	22
	Boiler #6	3714	22
	Boiler #4	3714	22
Detroit Diesel Corp	B & W	3519	22
Dow Corning Corp	Boiler # 8, 72 mmbtu/hr	2899	22
	Boiler # 6, 84 mmbtu/hr	2899	22
	Boiler #9, 72	2899	22
Eastern Michigan University	Boiler #1	8221	22
	Boiler #2	8221	22
Empire Iron Mining Partnership	Unit 1 Boilers (1-3)	1011	24
	Unit 2 Boilers (4-5)	1011	24
	Pit Boilers (6-7)	1011	24
	primary ore processing	1011	24
	Furnace Unit #1	1011	24
	Unit #1 scrubbers	1011	24
	Furnace Unit #2	1011	24
	Unit #2 scrubbers	1011	24
	furnace unit #3	1011	24
	Unit #3 scrubbers	1011	24
Escanaba Paper Co	Boiler 8	2611	22
	Boiler 9	2611	22
Ford - Livonia Transmission	Boiler #1	3714	22
	Boiler #3	3714	22
	Boiler #4	3714	22
Ford – Rawsonville	Boiler #1	3714	22
	Boiler #2	3714	22
	Boiler #5	3714	22
Ford – Saline	Boiler 166-77	3714	22
	Boiler 403-74	3714	22
Ford - Utica Trim	GRD Stor Boiler	3714	22
Gm - Pontiac Site Ope	Boiler #6	3714	22
	Boiler #7	3714	22
	Boiler #8	3714	22
	Boiler #9	3714	22
Gm - Powertrain Div	Boiler #6	3714	22
	Boiler #4	3714	22
	Boiler #5	3714	22
	Pouring/casting	33xx	20
Gm - Technical Ctr R	202 Boiler	3711	22
	Boiler #1	3711	22
Gm - Saginaw Metal	Boiler # 3-2	3321	22

Source Name	Unit Desp.	SIC	Category
	Boiler # 4-2	3321	22
Kalsec Inc Mfg Plant	Cleaver-Brooks	2087	22
Lafarge Midwest Inc.	Kilns 19	3241	4
	Kilns 20	3241	4
	Kilns 21	3241	4
	Kilns 22	3241	4
	Kilns 20	3241	4
Louisiana Pacific Corp	Boiler #3	2493	22
Marathon Ashland Petro	Crude Oil heater	2911	11
Marblehead Lime Co	Kiln	3274	12
Merillat Industries Inc	Wood Boiler	2434	22
Michigan State University	Boiler #2	8221	22
	Boiler #3	8221	22
	Boiler #1	8221	22
Michigan Sugar Co Caro	Pkg. Boiler#3	2063	22
Michigan Sugar Co Carrollton	Riley Boiler	2063	22
Michigan Sugar Co Sebewaing	Pkg. boiler	2063	22
National Steel Corp Gld	Coke ovens & operations	3312	6
	O2 furnaces & operations	3312	6
	Boiler #9, 10-100 MMBTU/HR	3312	6
	Boiler #8, 10-100 MMBTU/HR	3312	6
Rouge Steel Company	Reheat furnace & heater	3312	6
	Reheat furnace & heater	3312	6
	Blast Furnaces & operations	3312	6
Sappi	Calciner	2621	3
	Boiler #3	2621	3, 22
	Rec. Boiler	2621	3, 22
Stone Container Corp	Boiler	2611	22
The Regents Of The U Of M	Boiler #3	8221	22
	Boiler #4	8221	22
Tilden Mining Co Lc	Boiler #1(Pelletizing line #1)	1011	24
	primary crusher	1011	24
	cooler	1011	24
	dryer	1011	24
	Kiln	1011	24
Western Michigan University	Boiler #6	8221	22
William Beaumont Hospital	Boiler #1	8062	22
	Boiler #4	8062	22
	Boiler #5	8062	22

Table AI-2: Facilities with a Q/d >10 TPY/km

Facility	County	Sox*	NOx*	dV
Cargill Salt	St. Clair	78	179	0.5
Delphi Saginaw Steering	Saginaw	597	128	2.0
Gm Powertrain Group	Saginaw	6	3	0.0
LAFARGE(All Units)	Alpena	20623	10953	127.3
Marathon Ashland	Wayne	18	176	0.4
		353	182	1.1
Marblehead Lime	Wayne	124	366	1.0
MSU	Ingham	3133	1600	11.4
National Steel	Wayne	914	848	3.6
Rouge Steel	Wayne	1	455	0.9
Sappi	Muskegon	960	782	5.1
		3	135	0.4
		337	117	1.3
Smurfit/Stone Container	Ontonagon	1949	1128	23.5
U Of M	Washtenaw	0	67	0
Escanaba Paper Company	Escanaba	193	1,726.6	22
Cleveland Cliffs Corporation				
Tilden Mining Co	Marquette	590	5,314	22
Empire Iron Mining	Marquette	369	2,708	22

* In Tons

Table AI-3: Final List of BART-Subject Sources in Michigan

BART-Subject Facility Name	City	Category
LaFarge Midwest Inc.	Alpena	4
Saint Mary's Cement	Charlevoix	3
Smurfit/Stone Container Corp	Ontonagon	22
Escanaba Paper Company	Escanaba	22
Cleveland Cliffs Corporation		
Tilden Mining Co	Marquette	24
Empire Iron Mining	Marquette	24

Description of BART-Subject Facilities

PORTLAND CEMENT PLANTS

LaFarge Cement
Alpena, Michigan

LaFarge, has five BART-subject process units including five Portland cement manufacturing horizontal long-dry process kilns, Kiln numbers 19 to 23, with existing low NOx burners.

ST. Mary's Cement
Charlevoix, Michigan

St. Mary's has one BART-subject process unit including Portland cement manufacturing horizontal kiln and pre-calciner system with existing low NOx burners.

TACONITE PLANTS

Empire Mining
Palmer, Michigan
Cleveland-Cliffs, Empire Mining, has seven BART-subject process units including three indurating furnaces (Lines 1- 3 Kilns), Primary Crusher, and three boilers (Process Boilers 1, 2, and 3).

Tilden Mining:
Palmer, Michigan
Cleveland-Cliffs, Tilden Mining, has six BART-subject process units including an indurating furnace (Line 1 Kiln), Primary Crusher 1, Line 1 Pellet Cooler, Line 1 Dryer, and two process boilers (Process Boilers 1 and 2).

PAPER PRODUCTS PLANTS

New Page Corporation – Escanaba Paper Company
Escanaba, Michigan

Escanaba Paper, has five BART-subject process units including two process boilers (Boilers 8 and 9), one furnace (No. 10 Recovery Furnace), one Smelt Dissolving Tank, and one Lime Kiln.

Surfit-Stone
Containerboard Mill Division
Ontonagon, Michigan

Smurfit-Stone, has one BART-subject process unit including one process boiler (Riley Boiler # 1).

APPENDIX G

Reasonable Progress Goals Tables

The following tables come from *Reasonable Progress for Class I areas in the Northern Midwest—Factor Analysis* by EC/R Incorporated[1].

Table 4-2. Summary of Five-Factor Analysis of On-The-Books Controls

	Factor 1	Factor 2				Factor 3		Factor 4
Control Strategy	Cost effectiveness ($/ton)	Percent Emission Reductions from 2002 baseline in 2018		Percent Emission Reductions from 2002 baseline at full implementation		Energy	Solid waste produced (1000 tons/year)	Remaining Useful Life
CAIR and other cap-and-trade programs (e.g., Acid Rain, NOX SIP Call)	$720 - $2,600	3-State SO2:	13%	3-State SO2:	47%	4.5% of total energy consumed	2,383	The IPM model projects that 53 units will retire by 2018.
		NOX:	75%	NOX:	75%			
		9-State SO2:	34%	9-State SO2:	48%			
		NOX:	79%	NOX:	80%			
BART: Based on company BART analyses from MN and ND	$248 - $1,770							
Combustion MACTs	$1,477 - $7,611	9-State SO2:	10%	9-State SO2:	10%			
		NOX:	5%	NOX:	5%			
Highway vehicle programs	$1,300 - $2,300	3-State NOX:	83%	3-State NOX:	83%			
		9-State SO2:	80%	9-State SO2:	80%			
Nonroad mobile sources	($1,000) - $1,000	3-State NOX:	39%	3-State NOX:	39%	350 MM gallons of fuel saved		
		9-State SO2:	27%	9-State SO2:	27%			

[1] For complete paper, see http://www.ladco.org/MRPO%20Report_071807.pdf

Table 6.5-3. Summary of Visibility Impacts and Cost Effectiveness of Potential Control Measures

Emission category	Control strategy	Region	Pollutant	Average estimated visibility improvement for the four Midwest Class I areas (deciviews)	Cost effectiveness ($/ton)	Cost effectiveness per visibility improvement ($million/deciview)
EGU	EGU1	3-State	SO2	0.32	1,540	2,249
			NOX	0.06	2,037	2,585
		9-State	SO2	0.74	1,743	2,994
			NOX	0.17	1,782	2,332
	EGU2	3-State	SO2	0.41	1,775	2,281
			NOX	0.09	3,016	3,604
		9-State	SO2	0.85	1,952	3,336
			NOX	0.24	2,984	4,045
ICI boilers	ICI1	3-State	SO2	0.055	2,992	1,776
			NOX	0.043	2,537	1,327
		9-State	SO2	0.084	2,275	2,825
			NOX	0.068	1,899	2,034
	ICI Workgroup	3-State	SO2	0.089	2,731	1,618
			NOX	0.055	3,814	1,993
		9-State	SO2	0.136	2,743	3,397
			NOX	0.080	2,311	2,473
Reciprocating engines and turbines	Reciprocating engines emitting 100 tons/year or more	3-State	NOX	0.015	538	282
		9-State	NOX	0.052	506	542
	Turbines emitting 100 tons/year or more	3-State	NOX	0.008	754	395
		9-State	NOX	0.007	754	810
	Reciprocating engines emitting 10 tons/year or more	3-State	NOX	0.037	1,286	673
		9-State	NOX	0.073	1,023	1,095
	Turbines emitting 10 tons/year or more	3-State	NOX	0.011	800	419
		9-State	NOX	0.012	819	880
Agricultural sources	10% reduction	3-State	NH3	0.10	31 - 2,700	8 - 750
		9-State	NH3	0.16	31 - 2,700	18 - 1,500
	15% reduction	3-State	NH3	0.15	31 - 2,700	8 - 750
		9-State	NH3	0.25	31 - 2,700	18 - 1,500
Mobile sources	Low-NOX Reflash	3-State	NOX	0.007	241	516
		9-State	NOX	0.010	241	616
	MCDI	3-State	NOX	0.015	10,697	7,595
		9-State	NOX	0.015	2,408	4,146
	Anti-Idling	3-State	NOX	0.009	(430) - 1,700	(410) - 1,600
		9-State	NOX	0.006	(430) - 1,700	(410) - 1,600
	Cetane Additive Program	3-State	NOX	0.009	4,119	3,155
		9-State	NOX	0.008	4,119	10,553

Table 6.5-2. Estimated Visibility Impacts of Potential Control Strategies

Strategy and region				Estimated visibility improvement on the 20% worst-visibility days in 2018 (deciviews)				
				Boundary Waters	Voya-geurs	Isle Royale	Seney	Average
EGU	EGU1	3-State	SO2	0.30	0.12	0.44	0.41	0.32
			NOX	0.07	0.05	0.06	0.04	0.06
		9-State	SO2	0.77	0.35	0.84	1.01	0.74
			NOX	0.18	0.24	0.15	0.12	0.17
	EGU2	3-State	SO2	0.46	0.21	0.52	0.46	0.41
			NOX	0.12	0.08	0.09	0.07	0.09
		9-State	SO2	0.87	0.40	0.96	1.18	0.85
			NOX	0.26	0.30	0.23	0.19	0.24
ICI boilers	ICI1	3-State	SO2	0.065	0.035	0.067	0.055	0.055
			NOX	0.074	0.048	0.026	0.023	0.043
		9-State	SO2	0.090	0.047	0.092	0.109	0.084
			NOX	0.098	0.070	0.048	0.058	0.068
	ICI Workgroup	3-State	SO2	0.105	0.055	0.107	0.088	0.089
			NOX	0.095	0.061	0.034	0.030	0.055
		9-State	SO2	0.145	0.075	0.148	0.176	0.136
			NOX	0.114	0.082	0.056	0.067	0.080
Reciprocating engines and turbines	Reciprocating engines emitting 100 tons/year or more	3-State	NOX	0.027	0.017	0.009	0.008	0.015
		9-State	NOX	0.074	0.053	0.036	0.044	0.052
	Turbines emitting 100 tons/year or more	3-State	NOX	0.014	0.009	0.005	0.005	0.008
		9-State	NOX	0.010	0.007	0.005	0.006	0.007
	Reciprocating engines emitting 10 tons/year or more	3-State	NOX	0.064	0.041	0.023	0.020	0.037
		9-State	NOX	0.105	0.075	0.051	0.062	0.073
	Turbines emitting 10 tons/year or more	3-State	NOX	0.019	0.013	0.007	0.006	0.011
		9-State	NOX	0.017	0.012	0.008	0.010	0.012
Agricultural sources	10% reduction	3-State	NH3	0.09	0.11	0.10	0.10	0.10
		9-State	NH3	0.15	0.18	0.15	0.17	0.16
	15% reduction	3-State	NH3	0.14	0.17	0.15	0.14	0.15
		9-State	NH3	0.23	0.27	0.23	0.26	0.25
Mobile sources	Low-NOX Reflash	3-State	NOX	0.006	0.007	0.009	0.006	0.007
		9-State	NOX	0.008	0.009	0.012	0.012	0.010
	MCDI	3-State	NOX	0.015	0.019	0.014	0.013	0.015
		9-State	NOX	0.014	0.018	0.013	0.013	0.015
	Anti-Idling	3-State	NOX	0.008	0.011	0.008	0.008	0.009
		9-State	NOX	0.005	0.007	0.006	0.006	0.006
	Cetane Additive Program	3-State	NOX	0.009	0.011	0.009	0.008	0.009
		9-State	NOX	0.006	0.007	0.009	0.010	0.008

Table 4.5-1. Comparison of Overall Visibility Goals in 2018 with Projected Impacts for On-the-Books Controls[a]

	Estimated visibility impairment on the 20% worst-visibility days(deciviews)			
	Boundary Waters	Voyageurs	Isle Royale	Seney
Baseline conditions (2002)[a]	19.86	19.48	21.62	24.48
Projected conditions in 2018 with on-the-books controls (including BART)[b]	18.94	19.18	20.04	22.38
Net change	0.92	0.30	1.58	2.10
Glide path goal for 2018	17.70	17.56	19.21	21.35

Table 1: SO2 and NOX emission rates for EGUs per state for the nine-state region based for 2001-2003 emission rates and 2018 emission rates based on IMP3.0 modeling, as well as corrected IPM rates based on what controls are contracted (will do) and planned (may do) within each state (results from LADCO modeling).

	Scenario	SO2 (lb/MMBTU)	NOx (lb/MMBTU)
IL	**2001 - 2003 (average)**	**0.74**	**0.35**
	IPM3.0 (base)	0.423	0.107
	IPM3.0 - will do	0.214	0.096
	IPM3.0 - may do	0.214	0.096
IN	**2001 - 2003 (average)**	**1.25**	**0.45**
	IPM3.0 (base)	0.479	0.120
	IPM3.0 - will do	0.832	0.170
	IPM3.0 - may do	0.823	0.169
IA	**2001 - 2003 (average)**	**0.67**	**0.40**
	IPM3.0 (base)	0.434	0.224
	IPM3.0 - will do	0.434	0.224
	IPM3.0 - may do	0.377	0.220
MI	**2001 - 2003 (average)**	**0.92**	**0.35**
	IPM3.0 (base)	0.484	0.158
	IPM3.0 - will do	0.484	0.158
	IPM3.0 - may do	0.484	0.158
MN	**2001 - 2003 (average)**	**0.50**	**0.42**
	IPM3.0 (base)	0.276	0.186
	IPM3.0 - will do	0.243	0.221
	IPM3.0 - may do	0.229	0.175
MO	**2001 - 2003 (average)**	**0.63**	**0.37**
	IPM3.0 (base)	0.545	0.163
	IPM3.0 - will do	0.532	0.163
	IPM3.0 - may do	0.532	0.163
ND	**2001 - 2003 (average)**	**0.85**	**0.45**
	IPM3.0 (base)	0.240	0.258
	IPM3.0 - will do	0.328	0.343
	IPM3.0 - may do	0.328	0.343
SD	**2001 - 2003 (average)**	**0.63**	**0.80**
	IPM3.0 (base)	0.199	0.114
	IPM3.0 - will do	0.199	0.114
	IPM3.0 - may do	0.199	0.114
WI	**2001 - 2003 (average)**	**0.77**	**0.36**
	IPM3.0 (base)	0.379	0.167
	IPM3.0 - will do	0.445	0.163
	IPM3.0 - may do	0.185	0.137
	EGU Strategy 1	**0.15**	**0.10**
	EGU Strategy 2	**0.10**	**0.07**

APPENDIX H

Long-Term Strategy for the State of Michigan

Regional haze is a multi-pollutant problem of decreasing visibility with fine and coarse particulate matter. Reducing pollution and increasing visibility will require a regional effort. The State of Michigan is currently working on a SIP for fine particulate matter (PM2.5) in Southeast Michigan and has residual ozone nonattainment areas in Southern Michigan. Additionally new National Ambient Air Quality Standards (NAAQS) that have come out for PM2.5 and that will likely be developed for ozone will require Michigan to make additional reductions.

Michigan's Long-Term Strategy includes those control strategies we plan to undertake and which we consider to be reasonable. It will also include any known controls that are being undertaken in the nearby states. At this time, Michigan has set its reasonable progress goals based on known, on-the-books controls because other States have yet to determine what controls are reasonable for Regional Haze SIPs. Also, Michigan and other states have not determined reasonable control measures for other health-based standards (PM2.5 and ozone). In its 2013 mid-term review, Michigan will revise the modeling and RPGs to more accurately reflect the controls that Michigan and other States will be installing.

The Michigan Long-Term Strategy includes the emission reductions from the following federal and state programs in Michigan and other states:

- CAIR
- BART
- Reciprocating Internal Combustions Engine (RICE) MACT
- Industrial Boilers and Process Heaters MACT
- 2007 Highway Diesel Rule
- Tier II Emissions Standards
- Low Sulfur Gasoline
- Non-road Diesel Rule
- Control of Emissions from Unregulated Non-road Engine
- Locomotive/Marine ANPRM

In addition, Michigan has or will obtain further reductions from the following:

- Integrated iron and steel mill reductions-Southeast Michigan
- Oil Refinery reductions-Southeast Michigan
- School bus retrofits-Southern Michigan
- Switch yard locomotive retrofits-Southeast Michigan
- Consumers Product Rule-Statewide
- Low RVP fuel -Southeast Michigan
- Mercury Rule - Statewide

APPENDIX I

MANE-VU Class I States' Consultation
Open Technical Call Summary
July 19, 2007

Introduction & Purpose of Call (A. Garcia, MANE-VU)

Anna Garcia opened the call at 10 am (EDT) with a welcome and roll call by all three RPOs (see attached list of participants). She then reviewed the purpose of today's call, including:

After asking for general questions about the agenda and call purpose, the MANE- VU representatives began the substance of the call with an overview of the technical work to be discussed as organized in the MANE-VU briefing books provided for the call.

MANE-VU Contribution Assessment (G. Kleiman, NESCAUM)

Gary Kleiman provided a brief summary of the contribution assessment work that MANE-VU conducted to help them determine which states the Class I states would request be involved in consultation (see Tabs 4 & 5 of briefing book).

Discussion:

- M. Koerber (MRPO): Requested documentation of 2018 projections – MANE-VU work seems consistent with MRPO analyses. Also, it looks as if the Northeast states will be below the glide path for uniform progress by 2018.
- G. Kleiman (NESCAUM): There seems to be pretty good consistency across all the RPOs in terms of their modeling work. Also, VISTAS new emission inventory with GA reductions is not in the MANE-VU modeling. It also includes MANE-VU's 500 ppm low sulfur fuel strategy, but not the 15 ppm level.
- R. Papalski (NJ): So the modeling does take into account 500 ppm sulfur fuel oil?
- G. Kleiman (NESCAUM): Yes, and that is significant (not including VT or DE).
- M. Koerber (MRPO): I notice that in 2018 organic carbon is more significant, and may be as significant as sulfate. This issue is very complex, especially in urban areas. Where is MANE-VU's organic carbon coming from? MRPO will be interested in what our control measures analysis says for organic carbon.
- G. Kleiman (NESCAUM): There is some uncertainty with regard to what the modeling is indicating about organic carbon in 2018 – that is why MANE-VU is focusing on sulfate now.
- P. Wishinski (VT): Sulfate dominates extinction. Organic carbon does not contribute as much to extinction as sulfate in the MANE-VU region.
- P. Brewer (VISTAS): After discussion with Gary at MARAMA Science Meeting, our approach was more understandable.
- B. Lopez (WI): This work was based on IPM 2.1.9 – what is expected if put in context of EPA's IPM 3.0 runs?

- S. Wierman (MARAMA): IPM 3.0 results were not available at the time this analysis was done, so we used 2.1.9 with updated gas curves.
- L. Nixon (NH): On state by state basis sulfur levels from EPA 3.0 model runs. Liz, took a quick look at 3.0 and same SO_4 increases that look problematical.

MANE-VU Reasonable Progress Project Summary (S. Wierman, MARAMA)

Susan Wierman provided a brief summary of the reasonable progress work that MANE-VU conducted to help them develop long-term strategies and control measures for the 2018 state implementation plans(see Tab 7 – A, B and C - of briefing book).

Discussion:

- J. Hornback (SESARM): Are costs in 1999 dollars? If so, how do they compare in current dollars?
- S. Wierman (MARAMA): Yes, these are reflected in 1999 dollars. If converted to 2006 dollars the cost figures would be higher – multiply 1999 by 1.186 to go from 1999 $ to 2006 $.
- D. MacLeod (VA): Regarding the MANE-VU statement, how would disagreements between a Class I State and a non MANE-VU state be handled in the SIP?
- A. Garcia (MANE-VU): The statements that MANE-VU issued are the request for the kinds of measures that our Class I states believe are needed based on the technical work we have done. In the consultations these requests are a starting point for discussion, and provide a basis for looking at the work the other RPOs have done in comparison to our work to determine what may be needed and is reasonable. According to the rule, the consultations are not expected to result in agreement on everything, but the areas of agreement and disagreement that occur via consultation are to be documented in the SIP.
- J. Johnson (GA): Regarding EGUs, is there a relationship between what is on pages 68-78 and CAIR+? And does MANE-VU have any idea of what level of reductions would result from CAIR+?
- S. Wierman (MARAMA): We have not done an analysis of CAIR+ and its impact on visibility. Impact on visibility is not one of the 4 factors and so is not applicable.
- M. Koerber (MRPO): Isn't there a 5^{th} factor in guidance - $/deciview ?
- S.Wierman (MARAMA) – EPA expects that we will look at visibility improvement, but still not a factor regarding reasonableness. MANE-VU is planning on looking at visibility improvement of the control measures we initially looked at as reasonable.
- S. Holman (NC): Modeling on visibility – are you doing CMAQ modeling for 2018? Or CALPUFF?
- G. Kleiman (NESCAUM): We are doing a CMAQ sensitivity run –not a full annual run, but for select periods, with tagging mechanism for different control measures.
- S. Holman (NC): In NC, 11 of 12 EGUs will have scrubbers - need to reflect units that have scrubbers on in VISTAS base G.

MANE-VU Long-Term Strategy/Statements

As discussions proceeded after the reasonable progress overview, participants began to ask questions about the MANE-VU resolution and statements (see Tab 3 of briefing book). These documents outline how MANE-VU is approaching the consultation process and a request that states pursue strategies in various sectors that MANE-VU believes are needed for its Class I areas, as a starting point for consultation discussions.

Discussion:

- F. Durham (WV): Regarding the low sulfur fuel strategy, will regulatory impact analyses for this measure be done on state or regional basis?
- G. Kleiman (NESCAUM), S. Wierman (MARAMA) & Ray Papalski (NJ): That will be done on state basis, but with coordination across the MANE-VU states. NJ will be doing an analysis, but there is also a federal role in terms of any national rulemakings that may happen on low sulfur fuel.
- J. Johnston (GA): What is the basis for saying that the low sulfur fuel strategy is reasonable for States outside MANE-VU?
- G. Kleiman (NESCAUM), S. Wierman (MARAMA), A. Garcia (MANE-VU): Actually the Class I states are looking for equivalent reductions to what they are doing in the low sulfur fuel strategy – not necessarily expecting that MRPO and VISTAS states will pursue a low sulfur fuel strategy. We are asking you to look at what is reasonable in terms of making equivalent reductions, which is the point of having the consultations. We know the MRPO and VISTAS states are looking at reasonable measures for your own Class I areas. During the consultation we anticipate comparing what you are looking at as reasonable with what we are requesting as a starting point for what is "potentially" reasonable.
- J. Johnston (GA): Is there flexibility to get more reductions from EGUs and fewer reductions from non-EGUs? What if, for example, we get more sulfate reductions from EGU sources equivalent to the amount of non-EGU MANE-VU reductions?
- P. Wishinski (VT), A. Garcia (MANE-VU): VT would support that kind of alternative. MANE-VU does envision that flexibility in our consultation discussions.
- M. Koerber (MRPO): An issue they have been looking at is actually setting a reasonable progress goal - what is MANE-VU's process for that?
- G. Kleiman (NESCAUM), A. Garcia (MANE-VU): A deciview number will come out of our CMAQ sensitivity runs, and agreed-to reductions after consultations, with full CMAC run. There may still be some overlap between what may and may not be agreed to and what the Class I states want to include as reasonable in CMAQ final run.
- M. Koerber (MRPO): There are very different EGU predictions between IPM 2.1.9, IPM 3.0, and what his states say will actually happen. Will it be possible to have further discussions after August 6th and August 20th consultations to refine and sync up EGU reductions and possible modeling run inputs?
- G. Kleiman (NESCAUM), A. Garcia (MANE-VU): It would be helpful for MRPO and VISTAS to share with us their information on their EGU inventory, so we can make sure our modeling for reasonable progress reflects their work and so that our states can understand what they will be doing. The in-person meetings are not the end of the

consultation process. Our states are interested in having a continued dialogue, beyond the August in-person meetings.

- M. Koerber (MRPO): On page 61, is WI in or out? (in VT letter due to its CALPUFF runs)
- P. Wishinski (VT): VT CALPUFF modeling indicated that WI contributed >2% of emissions, so VT wants to include WI in consultation process, even though there are no WI EGUs on 167 list
- L. Bruss (WI): Please give him or Kevin Kessler a call (608) 266-0603
- D. Valentinetti (VT): We agree with Mike that this is an ongoing process for best science
- D. Andrews (KY): The two EGU modeling runs in the table of 167 stacks do not show much correlation – why?
- S. Wierman (MARAMA): Because the modeling for each of the different runs is based on different days, there were different meteorological inputs to each model and variability in wind fields (shows importance of meteorology).

MWRPO Overview (M. Koerber, LADCO)

- The MRPO states have moved ahead with some of their own state rules (consumer products, AIM, etc.). They also have PM SIPS to do.
- We updated our modeling to use 2005 as base year and made changes to IPM 3.0 based on what we know will actually happen – will be quite a bit different from 2.1.9 (not ready by Aug. 6th)
- Would hope modeling would form basis for a collaborative on future control strategies
- MRPO internal consultation process for the Northern Class I states has been ongoing for once a year – completed a great deal of technical work.
- Their reasonable progress project by EC/R is finished- provides a new metric - $/deciview. Looked at "5th Factor" for on-the-books controls as context for candidate measures. Examined similar strategies as those that MACTEC did for MARAMA analysis. Now completing report on "5th Factor" - will send out later.
- Requirement to address regional haze Class I areas in state and outside state. Have done more work on who is contributing. Will provide MRPO states with a list of who they impact.

Discussion:

- A. Garcia (MANE-VU): Will MRPO states be looking for any national measures?
- M. Koerber (MRPO): Our Class I areas are still above the glidepath, so may need some regional/national reductions. We are looking at that – may have something as develop, but will not have it by Aug. 6th. Note that MANE-VU sites are at uniform progress with control measures but MRPO states are above uniform line.
- D. Littell (ME): How much of the contribution at their Class I sites is coming from Canada?
- M. Koerber (MRPO): On the 20% worst days, the contributions are mainly from the south.

- A. Garcia (MANE-VU): Would it be possible to include Canada (primarily Ontario) at the August 6th consultation? They have expressed an interest, and our northern Class I states would like to invite them to hear our discussions.
- M. Koerber (MRPO): That would be ok.

VISTAS Overview (Pat Brewer, VISTAS)

- In VISTAS we the focus is on sulfate as well.
- Started with IPM 2.1.9 – in Base G, took account of results supplied by utilities – created hybrid between 2.1.9 and ground – truthing in summer 2006 (somewhere between versions 2.1.9 and 3.0) – pretty close to MV CAIR+ results. Base G2 has some changes in GA & FL
- See improvements at Southwest and Appalachian sites – mountain sites below the uniform progress line; less improvement at coastal sites – very close to uniform progress. Smaller reductions in units affecting relative reductions over whole year. GA and FL are working closely together on those sites.
- Distributed reasonable progress approach to stakeholders - looked at areas of influence.
- Reasonable progress analysis based on area of influence approach shows sulfate from EGUs and other sources dominated – most responses from sulfate reductions. When looking at areas of influence, we looked at their sulfate sources
- In modeling we included Brigatime and other sites
- Look at cost of controls, what are sulfate emissions after implementing the on-the-way controls. After 2018, EGUs still contribute 40% of emissions. Coal burning ICI boilers are the next largest at 20-30% of emissions, also a small percent from glass, pulp and paper, etc. Know by SEC code what kind of sources and costs of typical measures (AirControl.net). Will be using MARAMA 4- Factor analysis to inform their process.
- Delivered lists of sources in areas of influence in November. VISTAS states consultation occurred in December 2006 - agreed on approach to take on 4- Factor analysis. Got back together in May and repeated our process. Some states sent letters asking them to look at certain kinds of sources -- "tell us what you decide when you do your analysis of these sources on your Class I areas." Provided schedules on next steps of SIP process.
- VISTAS has interstate consultations going on in southern states - May 2007 consultation, too, plus June FLM/EPA meeting, intrastate consultations . Now consultation has started with MANE-VU
- FLM/EPA feedback is commitment to good mid-course review in 2012 to see where EGU reductions are actually occurring .

Discussion:

- S. Wierman (MARAMA): Please elaborate on your comment that IPM run with Base G are "close to" MANE-VU CAIR+ run?
- P. Brewer (VISTAS): There are similarities with MACTEC top 30 for VISTAS EGUs
- A. Garcia (MANE-VU): We/ MANE-VU received similar look-back comments from our FLMs
- J. Hornback (SESARM): Everyone should look at emissions reductions that are already in place. Substantial reductions have occurred already, not just what's going to occur in

2018. Benefits from additional controls for upcoming NAAQS will help regional haze, too – substantial reductions in the southeast.

- T. Allen (FWS): CAIR uncertainly can be addressed by communicating with EGUs and can include in SIP instead of waiting for look-back
- G. Kleiman (NESCAUM): IPM projections a moving target, but info on controls on 167 stacks important to bring to consultation – we may not be very far apart. Any information that the RPOs and states can provide about controls on 167 Stacks would be very valuable. We also recognize that states are looking at their own measures. Any info on control measure decisions that you have made for your own sources may show we are closer - by August 6th and August 20th meeting.
- R. Papalski (NJ) Is the material from the VISTAS June meeting available?
- P. Brewer (VISTAS): Yes, all presentations from the June meeting are posted on VISTAS' website.
- J. Hornback (SESARM): More on 28% reduction – ICI sulfur goes up from 10% to 24% nationwide and could be possible national rule John H – 16% of sulfur from ICI boilers in 2002 up to 24% after CAIR. As we move into next round of fine particle work – ask whether we have enough info re ICI boilers. Impact, concern and what control options/cost are – talk to EPA? Uncontrolled/inadequately controlled sources
- A. Garcia (MANE-VU): Our states have done some work on ICI boilers and have some information developed already. We would be glad to work with MRPO and VISTAS on this issue.
- S. Wierman (MARAMA): It may be possible to include something on ICI boilers as a potential amendment to MANE-VU National ask statement. Might be possible for it to come out of consultations.
- J. Hornback (SESARM): We should continue to collect data and be ready to move forward.
- S. Wierman (MARAMA): We would appreciate feedback at the consultation on joining MANE-VU on its request for a Phase 3 CAIR

Comments from FLMs

- Pay attention to mid course review – look at where you will be in 2012 compared to where you expected to be.
- Regarding the 2012 look back – discussions of source can be helpful and included in this SIP, with recognition of uncertainty.

EPA

- John Summerhays (EPA Region 5) and Michelle Notariani (EPA/OAQPS), expressed their appreciation for being invited to participate on the call and on future consultations.

Outcomes & Next Steps

- R. Papalski (NJ): Asked that all RPOs bring a list of the 167 EGUs and any planned controls on those units to the August meeting.

- P. Wishinski (VT): To confirm, VT will be asking WI to participate in the August 6th meeting – will be calling WI to ask them to attend.
- A. Garcia (MANE-VU): Gave a brief overview of the upcoming consultation meetings on August 6th and 20th – asked for any further comments/changes to the agendas to be sent to her next week.
- T.Aburn (MD): Opportunity to work with EPA on CAIR "Phase 3" for 2018/2020 would be a great outcome of consultations – Ann, Strengthen numbers – Tad, can we talk about PM? Mike, very relevant and need to look ahead

Adjournment

Anna Garcia thanked everyone for their participation and promised to circulate a draft summary of the call for comment – asked that each RPO share their attendance lists for the open call all around via email. Information on this and other MANE-VU consultations will be posted on the consultation page of the MANE-VU website, www.manevu.org.

Attendees

MANE-VU

Affiliation	Name
Connecticut	Wendy Jacobs
Delaware	Jack Sipple
Maine	David Littell
Maine	Jeff Crawford
Maine	Tom Downs
Maryland	Tad Aburn
Maryland	Andy Hiltebridle
Massachusetts	Eileen Hiney
New Hampshire	Bob Scott
New Hampshire	Jeff Underhill
New Jersey	Chris Salmi
New Jersey	Ray Papalski
New Jersey	Sandy Krietzman
New York	Matt Reis
New York	Diana Rivenburgh
Penobscot Tribe	Bill Thompson
Vermont	Dick Valentinetti
Vermont	Paul Wishinski
MARAMA	Julie McDill
MARAMA	Susan Wierman
NESCAUM	Gary Kleiman
OTC	Doug Austin
OTC	Anna Garcia
EPA Region 1	Anne Arnold
EPA Region 1	Anne McWilliams
EPA Region 2	Bob Kelly
EPA Region 3	Ellen Wentworth
EPA Region 3	LaKeshia Robertson
FLM-NPS	Bruce Polkowsky
FLM-NPS	Holly Salazer
FLM-FWS	Tim Allen
FLM-FS	Ann Mebane

VISTAS

Georgia	Heather Abrams
Georgia	Jimmy Johnston
Kentucky	John Lyons
Kentucky	Diana Andrews
Kentucky	Lona Brewer
Kentucky	Martin Luther
North Carolina	Keith Overcash
North Carolina	Sheila Holman
North Carolina	Laura Booth
North Carolina	George Bridgers
South Carolina	Renee Shealy
South Carolina	John Glass
South Carolina	Maeve Mason
South Carolina	Stacey Gardner
Tennessee	Barry Stephens
Tennessee	Quincy Styke
Tennessee	Julie Aslinger
Virginia	Tom Ballou
Virginia	Doris MacLeod
Virginia	Mike Kiss
West Virginia	Fred Durham
West Virginia	Bob Betterton
West Virginia	Laura Crowder
EPA Region 4	Brenda Johnson
EPA OAQPS	Michele Notarianni
Metro 4/SESARM	John Hornback
VISTAS	Pat Brewer

MANE-VU/MRPO Consultation Meeting
August 6, 2007
Rosemont, IL

On Monday, August 6, 2007, the Mid-Atlantic/Northeast Visibility Union (MANE-VU) Class I states (Maine, Vermont, New Hampshire, and New Jersey) held a consultation with several of the Midwest Regional Planning Organization (MRPO) states (Illinois, Indiana, Ohio, Michigan and Wisconsin). The following summary documents the discussions that took place during the consultation.

Summary of Today's Consultation Agreements

1. Define next steps for multi-pollutant approach to reduce regional haze, PM 2.5, and ozone

2. Discuss crafting a revised national ask among interested MANE-VU and MRPO states regarding needs for national action on EGUs, including potential multi-pollutant control levels for CAIR Phase III with emission rates and output-based options;

3. Pursue discussions on options for reducing SO2 (and NOx) emissions from ICI boilers, including:
   - Reconvening the MANE-VU/MRPO ICI boiler workgroup to re-examine the workgroup's January 2007 straw proposal;
   - Developing a process for sharing information on SO2 RACT for ICI boilers, and examining potential SO2 control measures;
   - Contacting NACAA regarding expansion of the Boiler MACT model rule work to address SO2 and NOx; and
   - Discuss crafting a national ask among interested MANE-VU and MRPO states regarding national action on ICI boilers.

4. Discuss crafting a national ask regarding low sulfur fuel for all off-road sources, and share information on biodiesel.

5. Continue to share modeling assumptions and analyses, and continue dialogue between MANE-VU and MRPO states regarding SIP submittals.

6. Define next steps to gather information on controls for locomotives and ocean-going vessels.

7. Develop list of controls for units that will be scrubbed, not just MANE-VU's list of 167 stacks.

Attendees

States and Tribes	FLMs and EPA
Maine – Dave Littell, Jeff Crawford	**National Park Service** – Bruce Polkowsky
New Hampshire – Tom Burack, Bob Scott	**Forest Service** – Anne Mebane, Chuck Sams, Rich Fisher
New Jersey – Chris Salmi	**Fish and Wildlife Service** – Tim Allen
Vermont –Justin Johnson, Dick Valentinetti, Paul Wishinski	**EPA Region I** – Anne Arnold
Illinois – Laurel Kroack, Scott Leopold	**EPA Region II** – Bob Kelly
Indiana – Tom Easterly, Ken Ritter	**EPA Region III** (by phone) – Ellen Wentworth, Neil Bigioni
Ohio – Bob Hodanbosi	**EPA Region V** – John Summerhays
Michigan – Vince Hellwig, Cindy Hodges, Bob Irvine	**EPA – OAQPS** (by phone) – Todd Hawes, Michelle Notarianni
Wisconsin – Larry Bruss	
MRPO – Mike Koerber	
MANE-VU – Anna Garcia, Doug Austin	
MARAMA – Susan Wierman, Julie McDill	
NESCAUM – Gary Kleiman	

Consultation Meeting Presentations and Discussions

Welcome and Introductions – Goals for Today's Meeting - David Littell, Maine DEP

- Presented goals for today's consultation:
  - Review requirements, resources and critical timing issues to ensure all share a common understanding;
  - Discuss options for control measures to identify what is reasonable for joint work between regions;
  - Identify impediments to implementing control measures and discuss how to address them;
  - Identify links between haze and PM that help define what is reasonable;
  - Examine reasonable progress for MRPO and MANE-VU Class I areas in terms of control measure options; and
  - Summarize points of agreement and identify issues for follow-up consultation
- Compare our request for what we need in terms of reductions to improve visibility at our Class I areas with what the MRPO states have done to address their own Class I areas and regional haze/PM issues
- Find out how close we are, what gaps may still remain, and discuss how we may address them together.

Overview of Open Technical Call & Consultation Briefing Book – Anna Garcia, MANE-VU

- Open Technical Call discussions provided a good technical basis for today's meeting.
- MANE-VU staff is developing draft documentation of the Open Call and of today's discussions, and will circulate the drafts for comment and make the final documentation available to all states for use in their state implementation plans (SIPs).

Summary of Reasonable Progress Work and Development of "Asks" for MANE-VU Class I Areas – Chris Salmi, New Jersey DEP

Presentation:

- Provided a review of MANE-VU Class I states' Resolution on Principles;
- Showed focus for MANE-VU is on sulfate reductions for the 2018 milestone;
- Gave an overview of MANE-VU's four factor analysis;
- Outlined how MANE-VU Class I states developed the "asks" for the MANE-VU and MPRO regions;
- Provided a comparative analysis of the MANE-VU region "ask" with that of the MRPO "ask";
- Outlined the specifics of each of the asks, including for MRPO:
  - Timely implementation of BART requirements;
  - A focused strategy for the electricity generating units (EGUs) comprising a 90% reduction of sulfate emissions from 2002 levels from 167 stacks that modeling indicates affect visibility impairment in MANE-VU Class I areas;
  - A 28% reduction from non-EGU sector emissions based on 2002 levels; and
  - Continued evaluation of other measures, including measures to reduce SO2 and nitrogen oxide (NOx) emissions from coal-burning facilities by 2018.
- Within MANE-VU, the Class I states have the following commitment:
  - Timely implementation of BART requirements;
  - A focused strategy for the electricity generating units (EGUs) comprising a 90% reduction of sulfate emissions from 2002 levels from 167 stacks that modeling indicates affect visibility impairment in MANE-VU Class I areas;
  - A low sulfur fuel oil strategy with different implementation timeframes for inner zone states versus outer zone states, that results in a 38% reduction from non-EGU sector emissions in the MANE-VU region; and
  - Continued evaluation of other measures, including measures including energy efficiency, alternative clean fuels and other measures to reduce SO2 and nitrogen oxide (NOx) emissions by 2018.
- Also outlined the national "ask" MANE-VU plans to make of the US EPA, for a Phase 3 of CAIR that reduces SO2 by at least an additional 18%.
- From presentation, next steps are:
  - Consult within and outside MANE-VU about which control strategies are reasonable;
  - Open a dialogue with the USEPA concerning a possible Phase 3 of CAIR;
  - Define strategies to include in the final modeling;
  - Determine goals based on the final modeling;
  - SIPs are due 12/17/07;
  - Adopt enforceable emissions limits & compliance schedules; and

- Progress evaluation due in 5 years.

Discussion:

- *Question (Tom Easterly, Indiana)*: Are there emission rate targets instead of a flat 90% reduction?
  - *Answer (Chris Salmi, New Jersey)*: No, and no net reductions.
- *Question (Tom Easterly, Indiana)*: Where do the emissions go?
- Answer (Gary Kleiman, NESCAUM): MANE-VU EGU reduction on the order of 68,000 TPY would be "rearranged." They are spread out between all EGUs proportionately, except for those in the 167 stacks, to maintain the cap.*Question (Tom Easterly, Indiana)*: Did MANE-VU use the 0.5dV exemption threshold for BART sources?
  - *Answer (Gary Kleiman, NESCAUM)*: MANE-VU did not exempt any BART sources from the BART determination process.
- *Question (Mike Koerber, MRPO)*: What is the source of the MANE-VU numbers?
  - *Answer (Gary Kleiman, NESCAUM)*: They are from MARAMA's inventory work. National ask for EGU sector based on IPM results and increasing the SO2 ratios.
- *Comment (Mike Koerber, MRPO)*: The MANE-VU numbers are close to his, but we need to sync them up.
- *Comment (Tom Easterly, Indiana)*: Companies make economic analyses for installation of controls and we keep changing the rules on them.
  - *Answer (Gary Kleiman, NESCAUM)*: They are spread out between all EGUs proportionately, except for those in the 167 stacks, to maintain the cap.

Summary of Reasonable Progress Work for MRPO Class I Areas – Mike Koerber, MRPO

Presentation:

- MRPO results consistent with MANE-VU analyses.
- MRPO states still looking at strategies for their 4 northern Class I areas, nitrates a bigger share of visibility impairment, visibility impacts mostly from southerly transport.
- With OTB measures, we are above glide path in 2018 for all 4 Class I areas.
- Review of MRPO 5-Factor Analysis (including degree of visibility improvement) for reasonable progress.
- Review of new visibility metric of $/dV improvement, additional control measures comparable in costs to existing OTB controls, most visibility improvement obtained from MRPO's EGU1 (0.3dV) and EGU2 (0.4dV) strategies.
- MRPO analysis regional in nature, not a focused EGU strategy like MANE-VU due to different source / receptor relationships.
- Review of projected visibility levels, Seney above glide path in 2018, a lot more SO2 will need to be "squeezed" out of the system to achieve 2064 natural conditions.
- Review of MRPO source apportionment analysis, MRPO contributes 10-15% of visibility impairment at Lye Brook in Vermont.
- Conclusions and key findings from MRPO analyses:
  - Many Class I areas in the eastern half of U.S. expected to be below the glide path in 2018 (with existing controls), including those in the Northeast;
  - Contribution analyses show closer states have larger impacts; and

- Regional emission reductions (in 2013-2018 timeframe), such as those identified in MANE-VU's June 2007 resolutions, may be necessary to meet reasonable progress goals in the MRPO Class I areas and provide for attainment of new tighter PM2.5 and possibly tighter ozone standards in the MRPO states.

Discussion:

- *Question (Tom Easterly, Indiana)*: How do we deal with ammonia?
  - *Answer (Mike Koerber, MRPO)*: EPA won't touch it and ammonia is included in the analyses for completeness.
- *Question (Jeff Crawford, Maine)*: Are mobile measures included?
- - *Answer (Mike Koerber, MRPO)*: Only bundled measures including chip reflash and diesel retrofits where the states are not preempted from doing such measures.
- *Question (Tom Easterly, Indiana)*: Would a monthly electric bill of $150 be doubled?
  - *Answer (Mike Koerber, MRPO)*: Yes, at least doubled.
- *Question (Dave Littell, Maine)*: Are ammonia controls from the agricultural sector assumed?
  - *Answer (Mike Koerber, MRPO)*: Yes, assumes 10% ammonia reductions from best practices.
- *Question (Jeff Crawford, Maine)*: How much of the ammonia comes from CAFOs versus fertilizer application?
  - *Answer (Mike Koerber, MRPO)*: Two-thirds to three-quarters comes from CAFOs, but urban ammonia sources are also important.
- *Question (Tim Allen, F&W Service)*: How much benefit is there from ammonia controls?
  - *Answer (Mike Koerber, MRPO)*: The analysis shows that a 10% ammonia decrease that may be cost-effective will result in greater than a 0.10dV improvement.
- *Comment (Bruce Polkowsky, NPS)*: 10% is a lot.
- *Comment (Larry Bruss, Wisconsin)*: There is a lot of uncertainty when it comes to the effects of ammonia reductions.
- *Question (Doug Austin, MANE-VU)*: Is the $/dV analysis based on three states or nine?
  - *Answer (Mike Koerber, MRPO)*: It is based on three states, and a nine-state analysis would be higher
- *Comment (Gary Kleiman, NESCAUM)*: MANE-VU saw almost identical MRPO contributions in the 10-15% range.
- *Comment (Chris Salmi, New Jersey)*: New Jersey is looking at performance standards for the 24-hour PM2.5 standard and a potentially tighter ozone standard.
- *Comment (Laurel Kroack, Illinois)*: Illinois would be interested if New Jersey could share that information.

EPA and FLM Perspectives on RPGs and Reasonable Measures Work – Bruce Polkowsky, NPS; Chuck Sams, Forest Service; John Summerhays, EPA Region V; Todd Hawes, EPA - OAQPS

Bruce Polkowsky, National Park Service

- Tomorrow is the 30th anniversary of the passage of the 1977 Clean Air Act Amendments that enacted section 169A and established the regional haze program.

- The uniform progress line is "useful," but the 4-Factor analyses are most important from FLM perspective.
- Don't forget the 20% clean days reasonable progress goal (VISTAS getting 1 dv improvement).
- Are states being overly optimistic in their CAIR controls scenarios? Information coming in from states seems to be pointing to predicting a higher level of controls than what CAIR predicts.
- The location of controls is important for visibility as seen in the MANE-VU 167 stack analysis.
- The 2013 progress report is key, and it is important to know about new sources, too.
- PM 2.5, ozone and regional haze issues are all coming together in the 2013-2018 timeframe. The PM2.5 SIPs should take into account what the regional haze measures will achieve. Strategies should be coordinated to maximize their effectiveness for both regional haze, PM2.5, and ozone SIPs.
- The FLMs encourage states to be as detailed as possible in their regional haze SIPs, including dates, for control measure development. It is up to EPA through the approval and disapproval process as to how they will react to state promises to pursue control measures in the regional haze SIPs.

Chuck Sams, Forest Service

- There should be one hard copy of the regional haze SIP per FLM reviewer.
- The FLM goal is for comments back to the states 30 days before their public hearings.
- The FLMs need the SIPs as soon as possible for their 60-day review.
- The FLMs would appreciate a summary sheet that provides a cross-reference as to when the specific items on their checklist can be found in the SIP.
- There is an FLM expectation for ongoing consultation.

John Summerhays, EPA Region V

- There are three main requirements of the Regional Haze Rule:
  - (1) Reasonable Progress – lots of questions about what conclusions and questions about what EPA will have as a requirement to the different scenarios;
  - (2) BART – haven't seen much control taken on BART. EPA is thinking about how to ensure consistency in BART determinations by different states. EPA asks the RPOs to try to insure consistency across their states; and
  - (3) Consultations - RPOs have done valuable work in technical analyses and facilitating consultations.
- EPA appreciates being part of the current process and continuing that participation into the future.

Todd Hawes, EPA – OAQPS

- While EPA is not in a position to initiate consultations as required by the Regional Haze Rule, today's meeting is a good representation of what they envisioned the consultation process would be.

- EPA is getting lots of questions from states about the regional haze SIPs. Some states are saying they are not going to set reasonable progress goals, while some say they are only going to do BART, use it for their reasonable progress goal with no analysis.
- EPA is legally bound and expecting full SIPs on 12/17/2007 that include all of the required elements. It is not acceptable for states to say they do not have the time or resources, or that the SIP cannot be done by December 17.
- The EPA lawyers are working on "what if" scenarios.

Discussion:

- *Question to FLMs and EPA (Dick Valentinetti)*: Will the Federal agencies comment on the extent of agreement and disagreement on strategies?
  - *Answer (Bruce Polkowsky, NPS)*: Yes, they will.
- *Comment (Tim Allen, F&W Service)*: They will also be looking for regional consistency and that the various emission reductions for meeting the Class I reasonable progress goals are proportional between the states. They may comment more on any disagreements between RPOs.
- *Comment (Bruce Polkowsky, NPS)*: The continuing consultation requirement is in 308(i)(4). The MANE-VU states have provided input on format and frequency. The monitoring aspects are crucial and especially important to consult about.
- *Question to EPA (Bruce Polkowsky, NPS)*: The long-term strategy is a 10-year strategy from rule adoption, but are promises to look at reductions approvable?
  - *Answer (Todd Hawes, EPA)*: Realistically, we have to see what comes in December. They realize that they will not get 100% approvable SIPS in December 2007 and will have to see then what they will do about it.
- *Comment (Bruce Polkowsky, NPS)*: FLMs would rather have a SIP later that has all elements rather than one that is on time that does not.
- *Question to EPA (Susan Wierman, MARAMA)*: Can EPA process the BART SIPs first to start BART clock?
  - *Answer (Todd Hawes, EPA)*: Yes, they are discussing BART severability, and it would be easier to consider BART first if they get a complete SIP.
- *Comment (Susan Wierman, MARAMA)*: Holding up BART approvals due to incompleteness of the rest of SIP would be unfortunate. Glad to hear EPA discussing this issue.
- *Comment (Todd Hawes, EPA)*: They have 6 months to deem complete.
- *Question to MANE-VU (John Summerhays, EPA)*: How are BART compliance dates set in M-V?
  - *Answer (Susan Wierman, MARAMA)*: Some states are setting the date to be "as expeditiously as practicable." The states need to be doing their best to get BART controls in place as we do not want a repeat of the NOx SIP call delays. The BART requirement is one of the best ways in the Clean Air Act for getting old facilities controlled.
- *Question to MRPO (Todd Hawes, EPA)*: Can I get clarification on the $/dV metric developed by MRPO? Is there any cost-effectiveness breakpoint?
  - *Answer (Mike Koerber, MRPO)*: It is a reference point.
- *Question to EPA (Chris Salmi, New Jersey)*: How will EPA react to inconsistencies between state SIPs?

- *Answer (Todd Hawes, EPA)*: The rule says EPA is the arbiter of any disagreement and there is little guidance beyond that. EPA would lean heavily on consultation documentation, but EPA will ultimately have to decide.

- *Comment to EPA and FLMs (Chris Salmi, New Jersey)*: It is one of the MANE-VU Class I States principles that the FLMs will help identify and EPA will act upon any inconsistencies.

Roundtable Discussion on Reasonable Progress Goals and Reasonable Measures

States continued the consultation with a roundtable discussion open on all issues raised during the Open Technical Call and this consultation meeting. Most of the discussion focused on the substance of the MANE-VU statements, or "asks" from the MRPO states and from the U.S. EPA.

ICI Boilers, MACT and NOx/SO2 RACT

During the Open Technical Call it was suggested that there may be an opportunity to examine the scope of the ICI boiler sector and potential emission reductions from that source category. Several states brought up the recent vacatur of the Boiler MACT in terms of the possibility for states to work together on this sector. NACAA is discussing with its members and the Ozone Transport Commission and Northeast States for Coordinated Air Use Management an effort to develop a Boiler MACT model rule. While for Boiler MACT this effort would focus on hazardous air pollutants (HAPs), including volatile organic compounds (VOCs), it may be possible to include in that project a parallel process to gather information on NOx and SO2 emissions from the boiler sector and develop options for control strategies, separate from the MACT levels.

MANE-VU states also inquired about what MRPO states are doing for PM 2.5 attainment. Many of the MRPO states are focusing on local sources for urban excess, and it appears that EPA is discouraging a focus on regional strategies. Illinois informed the group that it has a multi-pollutant agreement including scrubbers. Illinois also has a statewide NOx RACT proposal with stringent levels and is working on SO2 RACT, such as low sulfur diesel for non-road and refinery SO2 reductions. These RACT proposals are working their way through Illinois' regulatory processes, so they are not yet included in SIPs and are not reflected in MRPO's modeling. Michigan may also look at statewide RACT under the new PM2.5 standard.

In addition to the work done by the ICI boiler workgroup, OTC has completed some regional inventory work on its ICI boilers and NESCAUM is completing a study on ICI boilers that was sponsored by EPA. All of this work can be included in the review of this sector.

Follow up items from this discussion include:

- Reconvene MANE-VU/MRPO ICI Workgroup that was initiated under the State Collaborative to re-examine ICI boiler work and define next steps;
- Contact NACAA about possible addition to Boiler MACT model rule work to examine potential for NOx and SO2 reductions and identify strategies; and

- Look at pursuing SO2 RACT regionally, as well as asking EPA again for an ICI national rule.

Low Sulfur Fuels

In addition to the low sulfur fuel measures that MANE-VU is pursuing, the states discussed other areas of opportunity for low-sulfur fuels, including nonroad low-sulfur diesel. Illinois indicated that they will be talking to their four refineries about non-road low-sulfur diesel Michigan indicated that they are looking at a possible executive order mandating low-sulfur non-road diesel for state contracts. MRPO states also expressed interest in low-sulfur fuel for locomotives.

New Hampshire inquired as to whether the cost for biodiesel is similar to low-sulfur diesel, and suggested that we share information on biodiesel as an option. New Jersey expressed interest in ocean-going vessels as a source sector for low-sulfur fuel opportunities. The National Park Service folks indicated that there is a recent World Trade Organization agreement that could be of use in this regard, and that this is a sector that the VISTAS and WRAP states are also looking into.

<u>Follow up items from this discussion include:</u>

- Look at federal rules that are in the works for non-road, locomotive and marine engines to see if there are gaps or opportunities that MANE-VU and MRPO could explore together; and
- Share information on biodiesel as a low-sulfur fuel option.

State/Regional EGU Strategy

States discussed the EGU strategy proposed by the MANE-VU Class I areas, regarding a focus to pursue reductions of 90% or greater from the 167 stacks identified on the MANE-VU list. The MANE-VU states have agreed to pursue 90% EGU reductions and a low-sulfur fuel oil strategy. MRPO states will continue to examine what the potential for reductions are at these units, and provide information about which sources in their states are putting controls on, to better inform the process and our modeling. According to the information MRPO has at this time, over 70% of the emissions from the 167 stacks on the list will be scrubbed. The question remains whether that will be enough, or whether MRPO will still need to address the remaining 30% even if it has a very low impact. Another issue was raised regarding whether it would be acceptable for MRPO states to substitute reductions from the non-EGU sector that go beyond the 28% level for reductions that may not be obtainable in the EGU sector. MANE-VU states indicated that this would likely be acceptable, depending on the location and type of non-EGU source.

MANE-VU states raised the question as to whether the 70/30 split is the same for the rest of the EGUs, i.e. those in the MRPO region that are not part of the 167 stacks on the list. MRPO responded that they can get that information and provide it to MANE-VU. For example, IPM indicates that Rockport will be getting controls, while MRPO's information from the source is

that they will not. There is also a concern that cumulatively, the controls that the EGU sources say are going on will be larger than what is required by CAIR, i.e., it will not reflect reductions that will be "sold" on the trading market, or what units they will be sold to, to keep emissions at the CAIR budget level.

Another concern was raised regarding the addition of controls to older EGUs and how they can be permitted given NSR issues for increases in other emissions. Some states responded that it has been possible to add scrubbers to older units and address increases in other emissions by fine-tuning the control systems.

Generally, while the concept is feasible, MRPO states anticipate needing more assistance and information from the MANE-VU Class I areas to understand the justification for controls on these units. In addition, it will be helpful to look at ways to incentivize the retirement/closing of old units and their replacement with cleaner technology, such as through output-based standards. We will also need to work together to craft language that will work in our SIPs to reflect the approach that MANE-VU is requesting that will be acceptable to EPA.

Follow up items from this discussion include:

- Continue to share specific information about what MANE-VU and MRPO sources are anticipating as controls on EGUs as compared to what is indicated in IPM modeling;
- Update our inventories and databases accordingly so that our information is "synched"; and
- Continue dialogue on approaches for addressing this sector to meet the 90% reduction target for the 167 stacks and on equivalent alternatives.

National "Ask" for CAIR Phase III

There is interest from some MRPO states in joining MANE-VU in its "ask" for a Phase III of CAIR. All of the MRPO states will review and consider the option as we continue our consultation process. For many MRPO states the real concern is obtaining PM 2.5 reductions; regional haze is not their primary concern. As we continue to discuss the national "ask" we need to develop control levels that will help all of our states with attainment for ozone, PM and regional haze. MANE-VU based its request on the recent IPM modeling work done on the levels that came out of the state collaborative work. Those levels are not as stringent as those that are in the original OTC multi-pollutant position, and we are in the process of reviewing them.

Follow up items from this discussion include:

- MANE-VU to revisit its multi-pollutant strategy;
- MRPO and MANE-VU to have discussions on potential multi-pollutant control levels for a CAIR Phase III; and
- Craft a revised national "ask" to reflect revised levels, as appropriate.

NEXT STEPS

In addition to the agreements reached during the discussions (listed at the beginning and in the roundtable discussion sections of this document) the MANE-VU Class I states and the

MRPO states agreed to continue the consultation dialogue on the upcoming State Collaborative call, scheduled for 10:00 am CDT, 11:00 am EDT on Thursday, August 16th. The states will continue discussions from today's meeting, bring forth additional issues as necessary, and have a first opportunity to review and discuss the draft documentation of the consultation.